4. Net sampling: Krill and zooplankton; submitted by Valerie Loeb (Legs I & II), Jenna Borberg (Leg I), Kit Clark (Legs I & II), Michael Force (Legs I & II), Nancy Gong (Leg II), Kate Harps (Leg II), Adam Jenkins (Legs I & II), Jessica D. Lipsky (Legs I & II) and Rob Rowley (Legs I & II).

4.1 Objectives: Objectives were to provide information on the demographic structure of Antarctic krill (*Euphausia superba*) and abundance and distribution of salps and other zooplankton taxa in the vicinity of Elephant, King George and Livingston Islands. Essential krill demographic information includes length, sex ratio, maturity stage composition and reproductive condition. Information useful for determining the relationships between krill and zooplankton distribution patterns and ambient environmental conditions was derived from net samples taken at established CTD/phytoplankton stations. The salp *Salpa thompsoni* and copepod species receive special attention because their interannual abundance variations may reveal underlying hydrographic processes influencing the Antarctic Peninsula ecosystem. Results are compared to those from previous AMLR surveys to assess between-year differences in krill demography and zooplankton composition and abundance over the 1992-2001 period. Additional historical data from the Elephant Island area are used to examine copepod species abundance and abundance relations between 1981 and present.

4.2 Methods and Accomplishments:

4.2.1 Large-Area Survey Samples

Krill and zooplankton were obtained from a 6' Isaacs-Kidd Midwater Trawl (IKMT) fitted with a 505µm mesh plankton net. Flow volumes were measured using a calibrated General Oceanics flow meter mounted on the frame in front of the net. All tows were fished obliquely from a depth of 170m or ca. 10m above bottom in shallower waters. Tow depths were telemetered from a depth recorder mounted on the trawl bridle. Tow speeds were ca. 2kts. Samples were collected at Large-Area survey stations during both cruise legs (See Figure 2 in Introduction). Three regionally distinct groups of stations are considered here (Figs. 4.1A & B). Elephant Island Area stations represent the historically sampled area used for long-term analyses of the Antarctic Peninsula marine ecosystem. West Area stations, north of King George and Livingston Islands, form a database with which to examine the abundance and length composition of krill stocks to predator populations at Cape Shirreff and to the krill fishery that operates in this area during austral summer months. South Area stations, located in Bransfield Strait, are used to monitor krill supplies available to predator populations in Admiralty Bay, King George Island.

4.2.2 Shipboard Analyses

All samples were processed on board. Krill demographic analyses were made using fresh or freshly frozen specimens. Other zooplankton analyses were made using fresh material within 2 hours of sample collection. Abundance estimates of krill, salps, and other taxa are expressed as numbers 1,000m^{-3} water filtered. Abundance information is presented for the Elephant Island, West and South Areas, and for the total survey area.

(A) Krill. Krill were removed and counted prior to processing other samples. All krill from samples containing <150 individuals were analyzed. For larger samples, 100-200 individuals were measured, sexed, and staged. Measurements were made of total length (mm); stages were based on the classification scheme of Makarov and Denys (1981).

(B) Salps. All salps were removed from samples of 2 liters or less and enumerated. For larger catches the numbers of salps in 1- to 2-liter subsamples were used to estimate abundance. For samples with $\leq$100 individuals, the two life stages (aggregate/sexual and solitary/asexual) were enumerated and internal body length (Foxton, 1966) was measured to the nearest mm. Representative subsamples of $\geq$100 individuals were analyzed in the same manner for larger catches.

(C) Fish. All adult myctophids were removed, identified, measured to the nearest millimeter, standard length, and frozen.

(D) Zooplankton. After krill, salps, and adult fish were removed the remaining zooplankton fraction was analyzed. All of the larger organisms (e.g., other postlarval euphausiids, amphipods, pteropods, polychaetes) were sorted, identified to species if possible, and enumerated. Following this the samples were aliquoted and smaller zooplankton (e.g., copepods, chaetognaths, euphausiid larvae) in three or four subsamples were enumerated and identified to species if possible using dissecting microscopes. After analysis the zooplankton samples (without salps and adult fish) were preserved in 10% buffered formalin for long-term storage.

4.2.3 Statistical Analyses

Data from the total survey area and three subareas were analyzed for between-cruise and between-year comparisons. Analyses included a variety of parametric and nonparametric techniques. Among these were Analysis of Variance (ANOVA), Cluster Analysis, Percent Similarity Indices (PSIs) and Kolmogorov-Smirnov cumulative percent curve comparisons (D_{max}). Cluster analyses uses were Euclidean distance and Ward's linkage methods; clusters were distinguished by a distance of 0.40 to 0.60. Clusters based on size characteristics utilized proportional length-frequency distributions in each sample with at least 17 krill or 80 salps. Zooplankton clusters were based on log transformed sample abundance data for the most frequently occurring taxa; because of their uniformly high abundance across the survey area salps were omitted from the initial analysis, but were included in cluster comparisons.

4.3 Results and Preliminary Conclusions:

4.3.1 Survey A, 18-30 January 2001

4.3.1.1 Krill:

<u>Krill Abundance (Table 4.1A, Figure 4.1A)</u>

Postlarval krill were present at 90 of the 101 survey stations (89%). They were most frequent and abundant in the South Area where they occurred in all 11 samples and had 116 1,000m^{-3} (+/- 331) mean and 22.5 1,000m^{-3} median abundance values. Significantly lower concentrations (ANOVA, P<0.01) were represented in samples from the Elephant Island and West Areas, which had respective mean values of 20.7 and 12.8 1,000m^{-3} and medians of 6.0 and 2.3 1,000m^{-3}.

<u>Length Composition (Figures 4.2A-D)</u>

Krill lengths ranged from 18-61mm; the overall size-frequency distribution was bimodal with peaks around 28-30mm and 50-52mm. Approximately 30% of total krill were <35mm (1+ age class), 10% were 35-42mm (2+) and 60% were >42mm (3+). Length-frequency distributions in the three subareas differed greatly. The large South Area catches were comprised of individuals primarily $\leq$35mm (65%) and secondarily $\geq$45mm (25%). In contrast, 92% of krill collected in the West Area were >45mm in length. Although clearly dominated by krill >45mm long (70%) the Elephant Island samples also contained modest proportions of 35-45mm (20%) and <35mm (10%) length categories.

Maturity Stage Composition (Table 4.2; Figures 4.3A-D)

Overall and subarea maturity stage composition was in accord with length-frequency distribution. The overall composition was represented primarily by mature (64%) and juvenile (26%) stages. Juveniles (63%) plus immature stages (20%) dominated the South; here small immature stage 2a males made up 14% of the total catch. These individuals represent the 1999/00 year class. Virtually all of the West Area krill were mature. Mature forms dominated the Elephant Island Area (84%) with small contributions by juveniles (10%) and immature (6%) stages. Males outnumbered females by 80% in the South, 60% in the West and 40% in the Elephant Island Areas. Over 91% of mature females in the West area were in advanced maturity stages (i.e., with developing ovaries [3c], gravid [3d] or spent [3e]) compared to 50% in the South and 59% in the Elephant Island Areas.

Distribution Patterns (Figures 4.4A, 4.5A & B)

Cluster analysis, performed on krill lengths in samples with ≥17 individuals, yielded three groups. Although median and modal lengths were relatively large and similar to one another (42mm and 47mm, Cluster 1; both 49mm, Cluster 2; both 52mm, Cluster 3) the clusters differed in overall length and maturity characteristics. Cluster 1 contained the broadest size range (18-56mm) and relatively large proportions of individuals <40mm. Accordingly, the mixed maturity stage composition included 27% juvenile, 14% immature and 59% mature stages. This cluster was represented at 13 stations in Bransfield Strait and east of Elephant Island. Cluster 2 lengths ranged from 23-58mm, with greatest representation by 45-55mm individuals. Juvenile and immature stages contributed 2% and 6%, respectively, and mature forms (predominantly males) 92% of the total; 66% of the mature females were in advanced maturity stages. This group was represented at 22 stations offshore of Cluster 1. Cluster 3 included lengths of 26-61mm, but was predominantly composed of mature forms >50mm. These krill were collected at 14 stations primarily north of Livingston and King George Islands. Here 60% of females were gravid; these comprised 26% of total krill suggesting active spawning in this area.

4.3.1.2 *Salpa thompsoni:*

Salp Abundance (Table 4.1A; Figure 4.6A)

Salps were collected at all 101 survey stations, with between 21 and 5,780 individuals per sample (8.4 to 2,222 1,000m^{-3}). Overall mean, standard deviation and median abundance values of 506 1,000m^{-3} (+/- 441) and 383 1,000m^{-3} reflect uniformly high salp concentrations across the entire survey area. Salps were least abundant in the South Area (281 1,000m^{-3} mean, 160 1,000m^{-3} median) and most abundant in the Elephant Island Area (599 1,000m^{-3} mean, 449 1,000m^{-3} median). Salp abundance in the West Area was significantly lower than in the Elephant Island Area (ANOVA, P<0.05).

Maturity Stages, Size and Age (Figures 4.7A, C & D)

The aggregate (sexual) stage made up 97% and overwintering solitary stage 3% of total individuals collected. Solitary stage salps were relatively most abundant in the West (4%) followed by Elephant Island (2.5%) and South (0.4%) Areas. Over 75% of these solitaries were ≤20mm in length and therefore resulted from recent spawning by the aggregates. Aggregate lengths ranged from 4-66mm, but individuals >54mm were scarce; the modal length was 28mm. Given these length attributes and an estimated growth rate of 0.44mm day^{-1} (Loeb *et al*., in press), seasonal aggregate chain production would have begun in mid-

September, become continuous by early October and peaked in late November. Aggregate length-frequency distributions within the subareas differed somewhat. Smallest salps were in the South Area where the median length was 15mm and 80% of individuals were <25mm in length. Somewhat larger aggregates were in the Elephant Island Area where 50% were ≤25mm. Largest aggregates were in the West Area where only 35% were <25mm and the median length was 30mm. Kolmogorov-Smirnov test comparisons of salp length distributions indicate that those of the South Area were significantly smaller than those in the West Area (D_{max}=55.0, $P<0.05$).

Cluster analysis of salp length composition at each station resulted in three groupings, which had overlapping size distributions, but distinctly different median and modal lengths. These groupings showed no coherent or meaningful distribution pattern across the survey area and thus do not warrant further analysis.

4.3.2.3 Zooplankton and Micronekton Assemblage:

<u>Overall Composition and Abundance (Tables 4.3 & 4.4A; Figures 4.8A & B, 4.9A & B)</u>

A total of 71 taxonomic categories (including copepod species) were identified in the 101 survey samples; on average 21 taxa were collected at each station. Copepods and *S. thompsoni* were present in all samples. Copepods numerically dominated the catch (mean and median abundance 2,247 and 565 1,000m^{-3}, respectively) and contributed 59% of total mean zooplankton abundance. The copepod assemblage was dominated by three species: *Calanoides acutus*, an "Oceanic" species, constituted 48%; *Metridia gerlachei*, a "Coastal" form associated with Gerlache Strait water influence, 33%; *Calanus propinquus,* another Oceanic form, contributed 6% of the total. The Oceanic and Gerlache Strait sources of dominant species are seen in the overall copepod abundance pattern. Second ranked salps constituted ca. 14% of the total. Although present in only 85% of samples, *Thysanoessa macrura* larvae ranked third in abundance and contributed 12% of the mean. Other relatively abundant taxa included chaetognaths (4.6%), larval krill (4%) and postlarval *T. macrura* (2%). Frequently collected but less abundant taxa included salp-associated amphipods *Vibilia antarctica* and *Cyllopus lucasii* (98% and 87% of samples, respectively) and postlarval krill.

All krill larvae were calyptopis stages. Calyptopis stage 2 (C2) was most abundant (66%) followed by C1 (24%) and C3 (10%). Total larval abundance and abundance of more advanced stages increased over the survey period. Significantly higher concentrations ($P<0.05$) and greater proportions of C2 vs. C1 larvae occurred in the West vs. Elephant Island Area. Krill larvae were most abundant offshore of the island shelf areas; they were absent in southern Bransfield Strait and an extensive region extending northward across the Elephant Island Area. These larvae probably resulted from spawning activity 3-5 weeks earlier (i.e., early- to mid-December, 2000; Ross and Quetin, 1989) and are indicative of a normal spawning season. Larval *T. macrura* also had significantly greater concentrations in the West vs. Elephant Island Area ($P<0.05$) while the postlarvae had greatest concentrations in the South Area ($P<0.01$ for both the West and Elephant Island Areas). As during previous years larval and postlarval *T. macrura* had diametrically opposed distributions, with larvae largely concentrated offshore of the island shelves and postlarvae largely over the shelves and within Bransfield Strait.

<u>Distribution Patterns (Table 4.5A; Figure 4.10A)</u>

Cluster analysis, applied to the abundance [Log (N+1)] of 26 taxonomic categories, present in ≥20% of the samples, was used to identify three groups. Although these taxa were common to all three clusters, they demonstrated different absolute and relative abundance relationships across the survey area. Cluster 3, present at 29 stations, had greatest overall zooplankton abundance. Copepods (primarily *Calanoides acutus, Metridia gerlachei* and "other species"), larval *T. macrura,* chaetognaths and larval krill numerically dominated here (87% of total mean abundance). Fifth-rank *S. thompsoni* contributed only 7% of total abundance. Concentrations of *C. acutus,* chaetognaths, larval krill and *Spongiobranchaea australis* here were significantly larger than in Cluster 2 (ANOVA, $P<0.05$), while those of *C. propinquus,* "other copepods", larval *T. macrura* and *Cyllopus lucasii* were significantly larger than in Clusters 1 and 2 ($P<0.01$). This typically oceanic species assemblage occurred north of Livingston and King George Islands and in the west Elephant Island Area. Total mean abundance of Cluster 1 was 39% that of Cluster 3. Cluster 1 was located at 24 stations most of which were within or adjacent to Bransfield Strait and represented a Coastal species assemblage. *Metridia gerlachei* alone comprised 53% of total mean abundance and, along with *S. thompsoni* and postlarval *T. macrura,* accounted for 75%. Concentrations of *M. gerlachei, T. macrura, Euphausia frigida* and *Diphyes antarctica* here were significantly greater than in Clusters 2 and 3 ($P<0.05$). Cluster 2 was characterized by lowest total zooplankton abundance and dominance by *S. thompsoni*. Although their concentrations were similar in the three clusters, salps contributed 48% of total mean zooplankton abundance here due to relatively low numbers of other taxa. This cluster occurred at 48 stations most of which were south of King George and in the south, east and northwest Elephant Island Area.

Diel Abundance Differences

Various species had diel abundance differences due to vertical migrations into the upper 175m at night. Significantly greater night vs. day abundance occurred for *S. thompsoni, E. frigida,* ostracods (ANOVA, $P<0.01$) and the copepod *Pleuromama robusta* ($P<0.05$). Night abundance of *M. gerlachei* was significantly greater than during day ($P<0.01$) and twilight ($P<0.05$).

4.3.2.4 Survey A, Between-Year Comparisons:

Krill (Tables 4.6, 4.7A, 4.8A & 4.9A)

Within the 1992-2001 AMLR data set, mean and median krill abundance values in the Elephant Island Area were intermediate to a high in 1996 (82 and 11 1,000m^{-3}) and a low in 1999 (5.3 and 1.7 1,00m^{-3}) and most similar to those of January 1992. Since juveniles comprised ca. 10% of krill here, increased abundance relative to 1999 resulted in part from recruitment (i.e., the 1999/00 year class). Moderate recruitment success of the 1999/00 year class was also supported by dense concentrations and large proportions of juveniles (63%) in the South Area (Table 4.2). Relatively high krill carbon biomass values during January 2001 were most similar to the mean in 1995 (242 1,000m^{-3}) and median in 1996 (72 1,000m^{-3}).

During January 2001, 58% of mature females in the Elephant Island Area were in advanced reproductive stages; most of these were undergoing ovarian development (3c). This value is intermediate to high in 1995, 1996 and 1999 (93-98% advanced stages) and low in 1993 and 1998 (6-20%) suggesting that spawning in the Elephant Island Area may have been somewhat delayed in 2001. Krill larvae were uniformly distributed across the west Elephant Island Area, as indicated by a relatively high median abundance value (9 1,000m^{-3}), but their concentrations were low relative to those in 1995 and 1999 (mean of 33 1,000m^{-3} vs. ca. 175 1,000m^{-3}). When the entire survey area is considered, frequency of occurrence and mean abundance of krill larvae rivaled the high values of 1995 and 1999 (Table 4.9A).

Salps (Tables 4.6 & 4.8A; Figure 4.11F)

While mean salp abundance in the Elephant Island Area was modest relative to the highs of January 1993, 1994 and 1998 (932-1,213 1,000m^{-3}) the median value was second only to that during 1994 and reflected widespread distribution of large numbers of aggregates. Extremely large concentrations like those of the 1993 and 1998 salp years were not encountered. Overall aggregate size distribution, with a continuous length range of 4-54mm, was compressed relative to most other years. The length-frequency composition was most similar to those of January 1994 and 1998 (D_{max} = 14.4 and 13.1, respectively) and reflects a relatively short but productive growing season.

Zooplankton Assemblage (Tables 4.5A, 4.6, 4.9A, 4.10A & 4.11A)

Noting the absence of 2000 data, mean copepod abundance in the Survey A area was the highest observed over the 1994-2001 period. This resulted from large concentrations of *C. acutus, M. gerlachei, C. propinquus* and other copepod species offshore (Cluster 3) and of *M. gerlachei* inshore (Cluster 1). As during all January surveys except 1994 and 1998, copepods numerically dominated the Elephant Island zooplankton assemblage. Mean copepod abundance here was slightly greater than values observed in January 1995, 1996, 1997 and 1999, but the lower median value reflected a less uniform distribution in 2001. As during January 1997 and 1999 *S. thompsoni* ranked second in abundance, but salp contribution to the Elephant Island Area assemblage in 2001 was greater than in those years (29% total mean vs. 12-18%). Mean and median values of third ranked *T. macrura* larvae were comparable with the highs observed in January 1996. Chaetognaths, postlarval *T. macrura* and krill larvae followed in mean abundance. January 2001 mean and median abundance values of chaetognaths were slightly lower than in 1995 and 1999 while those of *T. macrura* were exceeded by 1995-1998 values. Although larval krill mean abundance was modest relative to values in 1995 and 1999, the median value was the highest so far recorded. Abundance of only two species was significantly different from previous January-February surveys: that of *Cyllopus lucasii* was the highest recorded while that of *Vibilia antarctica* was higher than in 1995, 1996, 1997 and 1999 (ANOVA, $P<0.01$ in all cases). The salp *Ihlea racovitzai* had the lowest frequency of occurrence and abundance since it was first noted in 1998.

Overall taxonomic composition of the Elephant Island Area zooplankton assemblage in January 2001 was similar to that in 1997 and 1999 as indicated by PSI values of ca. 75. It differed from that during salp dominated 1994 and 1998 (PSIs ca. 40)

4.3.2 Survey D, 12 February-12 March 2001

4.3.2.1 Krill:

Krill Abundance (Table 4.1B, Figure 4.1B)

Krill were present in 76 of 96 Survey D samples (79%). They were comparatively rare in the South Area, where they occurred in only 5 of 10 samples and had respective mean and median abundance values of 3.3 and 0.3 1,000m^{-3}. Median krill abundance was an order of magnitude larger and similar in the West and Elephant Island Areas (5.2 and 4.9 1,000m^{-3}), respectively. The largest catch (7,336 individuals, 2,817 1,000m^{-3}) occurred over the shelf break northwest of Elephant Island. Other relatively large catches (275-1,344 individuals, 118-431 1,000m^{-3}) occurred over the shelf north of Livingston and King George Islands and primarily offshore of Elephant Island. Predominantly small catches were made in Bransfield Strait.

Length Composition (Figures 4.12A-D)

Krill lengths ranged from 20 to 60mm. The overall length distribution was polymodal with peaks around 26-27mm, 32-35mm, 44-45mm and 47-50mm, however 80% of individuals were >40mm and 50% >46mm in length. This polymodal size distribution also characterized krill collected within the Elephant Island Area; here krill <33mm (i.e., 1 year old) comprised 11% of the total. Primarily larger krill occurred in the other areas. In the West Area, 8% of individuals were <41mm and 50% were 49-59mm while in the South Area 92% were 45-57mm in length.

Maturity Stage Composition (Table 4.2B; Figures 4.13A-D)

Overall maturity composition included predominantly mature (74%) followed by immature (14%) and juvenile (12%) stages. This composition was also characteristic of the Elephant Island Area where juveniles contributed 13%, immature forms 15% and mature stages 72% of the catch. Here females outnumbered males by 30%; 92% of the females were in advanced reproductive stages and spent individuals (3e) comprised 43% of the total. Juveniles were minor constituents in the West (4%) and South (3%) Areas. In the West Area, males outnumbered females by 50%. Relatively large proportions of stage 3c-e females in the West Area suggests ongoing spawning activity there during mid-February.

Distribution Patterns (Figures 4.4B, 4.14A & B)

Cluster analysis of krill length-frequency distributions in 36 samples with ≥17 specimens yielded two groups. Cluster 1 krill included various size modes (25-26mm, 32mm and 45mm) and had median and modal lengths of 45mm and 48mm, respectively. Juveniles and immature stages each comprised 15% of the total. Males and females were equally represented. Relatively large proportions of spent (3e) females and immature males (2b-c) suggest that this was largely an aggregation of post-reproductive adults (3+) and younger year classes. This cluster occurred at 17 stations over the South Shetland Island shelf and south of the frontal zone extending across the Elephant Island Area. Cluster 2 included few krill <40mm, and only 6% were <45mm; median and modal length was 50mm. Juveniles were virtually absent and immature stages made up only 4%. Males outnumbered females by 2.4:1 and reproductive males comprised 61% of the total. Most of the females were reproductively active (73% stage 3c-d) and 24% were spent. This group was primarily represented in oceanic water offshore of the South Shetlands and northwest of Elephant Island.

4.3.2.2 *Salpa thompsoni:*

Salp Abundance (Table 4.1B; Figure 4.6B)

Salps were present in all samples with numbers of 38-7,690 per tow (16-2,420 1,000m^{-3}). Overall mean and median concentrations were, respectively, 391 and 270 1,000m^{-3}. Greatest concentrations (>1,000m^{-3}) were in the eastern half of the Elephant Island Area and south of King George Island. Mean and median abundance values in the West Area (249 and 198 1,000m^{-3}) were ca. 40% lower than in the other two areas.

Maturity Stages, Size and Age (Figures 4.7B-D)

Overall, aggregate forms made up 94% of individuals. Solitary forms were relatively more abundant in the West (9%) vs. Elephant Island (6%) and South (3%) Areas. Aggregate lengths ranged from 4 to 76mm, but 95% were ≤40mm and median length was 30mm. Median length was also 30mm in the West and Elephant Island Areas but 27mm in the South Area. Based on a growth rate of 0.44mm day^{-1} these salps were budded ca. 2 months prior to sampling in those areas (i.e., mid- to late December). Solitary lengths ranged from 4 to 117mm. Relatively small proportions of salps <20mm reflect negligible production over the past 5 weeks. Cluster analysis provided three groups with slightly different length-frequency distributions. These were characterized by median lengths of 26, 30 and 34mm and relatively few individuals >40mm (2%, 3% and 8%, respectively). As with Survey A, these groups did not demonstrate any coherent or meaningful spatial distribution patterns.

4.3.3.3 Zooplankton:

Overall Composition and Abundance (Tables 4.3 & 4.4B; Figures 4.8C, D & 4.9C, D)

The 96 Survey D samples contained 83 taxa, including nine copepod categories; the mean was 21 per sample. Copepods were present in all but one sample and were again numerically dominant (mean and median abundance, respectively, 5,916 and 1,416 1,000m^{-3}) and comprised >66% of total mean zooplankton abundance. The abundance relations of dominant species were similar to Survey A: *C. acutus* constituted >65% of mean copepod abundance, followed by *M. gerlachei* (25%), *C. propinquus* (4%) and unidentified copepodites (2%). The Oceanic and Coastal sources of these species again are obvious in the distribution patterns.

Larval stages of *T. macrura* and krill were second and third in mean abundance, and each contributed ca. 8% of the total. Median abundance of *T. macrura* larvae was an order of magnitude larger than that of krill larvae (210 vs. 10 1,000m^{-3}) resulting from a more uniform distribution. Both had greatest abundance in offshore waters. Most krill larvae were calyptopis stages. Overall C1 were most abundant (57%) followed by C2 (30%) and C3 (11%). This stage composition also characterized the West Area. Within the Elephant Island Area C2 larvae were most abundant (36%), followed by C1 (33%), C3 (18%) and stage 1 Furcilia larvae (8%). Small catches in the South Area were dominated by C3 larvae (67%). Postlarval *T. macrura* ranked fourth in abundance and contributed 7% to the mean; it was most abundant within and adjacent to Bransfield Strait. Salps were the most frequent taxon, present in all samples, but contributed slightly more than 4% of summed mean abundance (rank 5); median salp abundance (275 1,000m^{-3}) was exceeded only by copepods (1,416 1,000m^{-3}). Salp-associates, *V. antarctica* and *C. lucasii*, were present in >97% of samples.

Distribution Patterns (Table 4.5B; Figure 4.10B)

Cluster analysis resulted in three zooplankton groups. Cluster 3 was present at 27 offshore stations and had the largest summed mean abundance. Concentrations of *C. propinquus, C. acutus, R. gigas,* copepodites and other copepods, chaetognaths, larval *T. macrura*, the pteropod *Spongiobranchaea australis* and amphipod *Primno macropa* were significantly greater (ANOVA, P≤0.01) than in Clusters 1 and 2. Cluster 3 concentrations of *S. thompsoni* were significantly smaller than in Clusters 1 and 2 (P<0.05). Total mean abundance of Cluster 1 was ca. 50% smaller than that of Oceanic Cluster 3. This group was dominated by *M. gerlachei* and postlarval *T. macrura*, which, respectively, contributed 49% and 25% of mean abundance. Cluster 1 concentrations of *M. gerlachei, Pareuchaeta antarctica* and *E. frigida* were significantly larger than in Clusters 2 and 3 (P<0.01). This Coastal species assemblage occurred at scattered locations across the survey area; it was spatially most cohesive north and northeast of Elephant Island. Cluster 2 was characterized by low overall zooplankton abundance and numerical dominance by salps (36% of total mean abidance) and larval *T. macrura* (25%). This sparse assemblage occurred at 42 stations generally over island shelf areas and in Bransfield Strait.

Diel Abundance Differences

Various species had diel abundance differences due to vertical migrations into the upper 175m at night. During February-March, significantly greater night vs. day abundance occurred for three copepod species, *M. gerlachei, Pareuchaeta antarctica* and *Pleuromama robusta,* and two euphausiids *E. frigida* and *E.*

triacantha (P<0.01). Both *S. thompsoni* and *V. antarctica* had significantly larger twilight vs. day and night abundance (P<0.01).

4.3.2.4 Survey A and D 2001 Comparisons:

Krill

Krill demonstrated distributional and developmental changes as expected with the advancing season (Siegel, 1987). During Survey A, juvenile and immature stages were confined to Bransfield Strait while larger mature forms occupied shelf and offshore waters. Differences in sex ratio and maturity stage composition suggested advanced seasonal spawning activity in the West relative to Elephant Island Area at that time. Increased patchiness during Survey D was associated with (a) northward movement of juveniles and immatures, (b) southward movement of spent females and regressing male maturity stages and (c) late-season spawning activity offshore (Tables 4.2A & B; Figures 4.4A & B). Noteworthy was the abundance of immature stages in the West and Elephant Island Areas during Survey D (Table 4.2), which indicated modest recruitment success of the 1998/99 year class.

Salpa thompsoni

Mean and median salp abundance in the Elephant Island and West Areas decreased by 60-70% between the two surveys (Tables 4.4A & B; Figures 4.6A & B). In contrast, abundance in the South Area increased by ca. 50%. These changes were primarily due to the aggregate stage (Figures 4.7A-D). When January length-frequency distributions were advanced to match modes in February-March distributions, the shifts reflected temporal separation of Survey A and D sampling in each area: 10mm over 18 days for the West Area; 14mm over 31 days for the Elephant Island Area; and 18mm over 42 days for the South Area. In all cases an estimated aggregate growth rate of ca. 0.44mm day^{-1} was supported. Examination of the February-March length-frequency distributions revealed diminished numbers of aggregates >35mm in all three subareas. Abundance decreases in the West and Elephant Island Areas were largely due to this in conjunction with little new production; increased abundance in the South Area resulted from minor late-season chain production and a less dramatic loss of aggregates >35mm. The solitary stage contributed 3% of total salps in Survey A and 6% in Survey D. The increase was due to greater numbers of large individuals in the upper water column rather than small newly spawned overwintering individuals (Figure 4.7D). The Salp:Krill carbon biomass value (Table 4.8) remained low and similar to that of January due to decreased production after mid-December plus loss of large aggregates from the upper water column.

Zooplankton

Between Surveys A and D mean and median zooplankton abundance increased, respectively, 43% and 50%, and taxonomic richness increased by ca. 8%. Much of the abundance increase was due to copepods (*C. acutus, M. gerlachei, C. propinquus* and copepodites), *T. macrura* and krill larvae. The significant total copepod abundance increase (ANOVA, P<0.01) was due to seasonal ontogenetic migration to surface layers by *C. acutus* and *C. propinquus* and population growth of *M. gerlachei* (Atkinson, 1991; Atkinson *et al*., 1997; Huntley and Escritor, 1992; Ward *et al*., 1998). A moderate PSI value (72) reflects seasonal changes in abundance relations of dominant taxa across the large survey area: increased proportions of *C. acutus*, larval krill and postlarval *T. macrura;* decreased proportions of *M. gerlachei,* other copepods, salps and larval *T. macrura*. The four times abundance increase of krill larvae was mainly due to increased numbers of stage C1 (57%) and C2 (30%); these most likely were spawned over the first three weeks of January (Ross and Quetin, 1989). More developed stage C3 (11%) and F1 (2%) larvae resulted from mid- to late-December spawning.

Seasonal changes were more dramatic within the Elephant Island Area (PSI=57) due to large abundance increases of copepods (mainly *C. acutus*) and postlarval *T. macrura* (from rank 5 to 2 after total copepods) and decreases of other copepods and salps (from rank 2 to 4 after *T. macrura* larvae; Tables 4.3, 4.6 & 4.10).

Both surveys were characterized by extremely complex distribution patterns of individual species and zooplankton clusters indicating a great deal of mesoscale patchiness. Undoubtedly this complexity resulted from atmospheric and hydrographic conditions, including prevailing east winds and massive influx of icebergs from the Weddell Sea. Without information on geostrophic flow it is impossible to assess the biological patterns with respect to hydrodynamics. However, distribution differences of Oceanic and Coastal zooplankton assemblages between Surveys A and D (Figures 4.10A & B) suggest: (a) strengthening of the semipermanent Oceanic eddy northwest of Elephant Island; (b) offshore displacement of Coastal and Oceanic zooplankton in West and South Areas; and (c) both northeastward and westward transport of Coastal zooplankton across the northern Elephant Island Area.

4.3.2.5 Survey D Between-Year Comparisons:

<u>Krill (Tables 4.6, 4.7B, 4.8B & 4.9B)</u>

Krill abundance in the Elephant Island Area during February 2001 was high relative to other February-March surveys. The mean value was third highest after 1998 and 1996 and the median (tied with those of 1997 and 1998) followed the high observed in 1992. In terms of carbon biomass, the mean also ranked third while the median was second to that of 1997. Various factors can contribute to these results: (a) seasonal migrations of spent, juvenile and immature individuals into the area; (b) substantial proportions of large adults, remnants of the successful 1995/96 year class; and (c) modest recruitment of the 1998/99 year class.

Large proportions of advanced female maturity stages, particularly spent individuals (3e), along with substantial larval krill concentrations were also observed during February-March 1995 and 2000. These result from seasonally normal (i.e., December-March) spawning activity. This, in conjunction with presence of more developed larval stages (i.e., C3 and F1) and decreased salp abundance during mid-summer, bodes well for larval survival and 2000/01 year class success. Noteworthy is the fact that this is the third year in a row (1999, 2000 and 2001) that conditions have been favorable for krill recruitment.

Because of normal seasonal spawning activity and moderately high larval krill abundance monitored during the 1999 cruises "guarded optimism" was expressed for 1998/99 year class success. However, juveniles were virtually non-existent in February-March 2000 survey samples and so this year class warranted a 0.0 R_1 recruitment index value. The latter observation indicates the importance of the R_2 recruitment index (Siegel *et al*., 1998, 1999) and highlights the fact that interannual variability in distribution of the various krill maturity stages can greatly bias recruitment assessments based on the large survey area as well as much more limited Elephant Island Area.

<u>Salps (Table 4.6; Figure 4.14)</u>

Salp mean, standard deviation and median abundance values in the Elephant Island Area during 2001 were quite similar to those in February-March 1994. Additionally, marked seasonal decreases in salp abundance during 2001 and 1994 set these two years apart from the rest in the long term Elephant Island Area data set. Typically modest to substantial abundance increases here result from augmentation of aging populations by aggregate production over summer months. The aggregate length-frequency distribution in February 2001 most resembled that of 1998 (D_{max} = 9.6); these both resulted from relatively late onset of spring production, which peaked in November and essentially ended in late December. Diminished numbers of aggregates >35mm in length during 2001 was unique and suggested an extremely early seasonal migration out of the upper water column prior to production of overwintering solitary stages (Foxton, 1966; Casareto and Nemoto, 1986). It is possible that such a migration could have been prompted by the large influx of melting icebergs during February. The 1994 decrease, in contrast, appeared to be due to advection of salps out of the area.

Noteworthy is that prolonged budding periods with pulses of late-season aggregate production (1996, 1997 and 1999) preceded years with enhanced salp population size (Figure 4.14). In contrast; curtailed budding periods (1994 and 1998) preceded years with diminished salp populations. These observations support the idea that overwintering solitary seed population size is in part responsible for aggregate population growth the next spring and summer. Assuming that these trends continue, greatly reduced salp populations can be expected during the 2002 field season.

Zooplankton (Tables 4.6, 4.9B, 4.10B & 4.11B)

Zooplankton abundance in the Survey D area during 2001 was second to that in 2000. These periods, along with February-March 1994 and 1995, were characterized by relatively high copepod abundance. Total copepod and chaetognath abundance this year were significantly smaller than in 2000 (ANOVA $P<0.01$). Within the Elephant Island Area, moderately high mean and median abundance values of larval krill and larval *T. macrura* were, respectively, most similar to those of 1999 and 1996. Mean and median chaetognath abundance and median postlarval *T. macrura* abundance were also most similar to the 1996 values. Overall zooplankton taxonomic composition was similar to that of February-March 1999 (PSI=85) and 1996 (PSI=81) due to similar proportions of total copepods (62-65%).

Copepods (Table 4.12)

When put in a longer-term perspective, copepod species abundances in the Elephant Island Area during February-March 2000 and 2001 rank second and third behind the extremely high concentrations encountered during March 1981 (the krill "superswarm" year). The 1981 copepod assemblage was strongly dominated by *C. propinquus* (Weddell-Scotia Confluence affiliate) and *C. acutus* (Antarctic Circumpolar Current and East Wind Drift affiliate) but also had large concentrations of *M. gerlachei* (Gerlache-Bransfield Strait affiliate). February 2000 and 2001 were also characterized by relatively large concentrations of these three species, suggesting enrichment from both offshore and coastal environments. During all but the 1981 and February 2001 surveys, *M. gerlachei* was the most abundant species due to the prevailing coastal influence in this area. Maximum *M. gerlachei* abundance occurred in February 1989 when *C. acutus* and *C. propinquus* were relatively uncommon, suggesting primarily coastal enrichment at that time. In contrast to 1981, which had an associated strong krill, recruitment index (0.76) the recruitment index from 1988/89 was quite low (0.06; Loeb *et al*., 1997).

4.3.3 AMLR 2001 Cruise Summary

(A) Mean and median krill abundance values in the Elephant Island Area were intermediate to high in 1996 and low in 1999. Increased abundance relative to 1999 results in part from recruitment of the 1998/99 and 1999/00 year classes as indicated by modest proportions of juvenile and immature stages.

(B) Large proportions of advanced female maturity stages, substantial larval krill concentrations and late larval stages during February-March reflected normal seasonal spawning in 2000/01. This is the third year in a row that spawning conditions have been favorable for krill recruitment success.

(C) Both large area surveys were characterized by wide spread distribution of abundant salps (*Salpa thompsoni*) but extremely large concentrations like those of the 1993 and 1998 salp years were not encountered. Length-frequency distribution of the dominant aggregate stage indicated a curtailed production season. A dramatic 60% abundance decrease between the two surveys was apparently due to loss of large aggregates from the upper water column. This unique situation suggested early downward seasonal migration prior to production of overwintering solitary stages. Such a migration could have been prompted by the large influx of Weddell Sea icebergs during February.

(D) Within the 1993-2001 Elephant Island Area dataset, prolonged salp budding periods with pulses of late-season aggregate production preceded years with enhanced salp population size while curtailed budding periods preceded years with diminished salp populations. Assuming that these trends continue, reduced salp population size can be expected during the 2002 field season.

(E) Favorable krill spawning conditions in conjunction with reduced salp abundance improve the prospects of larval production and survival. Should winter sea ice development and spring bloom conditions also be favorable we may expect strong recruitment success of the 2000/01 year class.

(F) Copepod abundance values in the Elephant Island Area were among the highest observed between 1981 and 2001. This included large concentrations of *Calanoides acutus, Metridia gerlachei* and *Calanus propinquus* and indicated enrichment in oceanic and coastal waters relative to other years.

4.4 Disposition of Data and Samples: All of the krill, salp, other zooplankton and fish data have been digitized and are available upon request from Valerie Loeb. These data have been submitted to Roger Hewitt (Southwest Fisheries Science Center). Alcohol preserved specimens were provided to SIO scientists Linda Holland (salps) and Erica Goetze (copepods). Frozen myctophids were provided to Mike Goebel and Dan Costa (UCSC) for chemical analyses.

4.5 Problems and Suggestions: The 2001 AMLR field season was highly successful and enjoyable. The addition this year of stations across western Bransfield Strait will enable us to link hydrographic processes in the west and north Antarctic Peninsula (i.e., the LTER and AMLR study areas). It may be advantageous to add another line of stations, or amend coverage, in the Bransfield area east of this line to strengthen this analysis. It was extremely helpful to have the expert assistance of CTD technicians at sea. However, we are still handicapped by the lack of an experienced physical oceanographer who can provide real time information on water mass distribution and dynamics. With regard to hydrodynamics, it would be extremely beneficial to have information collected with an acoustic Doppler current profiler! This is especially true for examining transport of krill larvae in relation to recruitment success in the survey area and advection to South Georgia.

The zooplankton van would benefit from modifications making it more comfortable and more easily maintained for use by both the krill and fish stock assessment surveys. Improvements would include (a) replacing storage areas with microscope benches allowing assistants to be seated while performing sample analyses and (b) installation of stainless steel counters to allow efficient and effective cleaning.

We were very pleased with the inclusion of a benthic bycatch survey during Leg III and hope that this becomes a regular part of the fish stock assessment work. In addition to assessing the impact of trawling operations on the benthic environment, it provided a great deal of useful information on the structure and composition of habitats critical to fish.

4.6 References:

Atkinson, A. 1991. Life cycles of *Calanoides acutus, Calanus simillimus* and *Rhincalanus gigas* (Copepoda: Calanoida) within the Scotia Sea. *Marine Biology* 109: 79-91.

Atkinson, A., Schnack-Schiel, S.B., Ward, P., and Marin, V. 1997. Regional differences in the life cycle of *Calanoides acutus* (Copepoda: Calanoida) within the Atlantic sector of the Southern Ocean. *Marine Ecology Progress Series* 150: 99-111.

Casareto, B.E., and Nemoto, T. 1986. Salps of the Southern Ocean (Australian sector) during the 1983-84 summer, with special reference to the species *Salpa thompsoni,* Foxton 1961. *Memoirs of the National Institute of Polar Research* 40: 221-239.

Huntley, M., and Escritor, F. 1992. Ecology of *Metridia gerlachei* Giesbrecht in the western Bransfield Strait, Antarctica. *Deep-Sea Research* 39: 1027-1055.

Loeb, V., Amos, A., Hewitt, R., Hofmann, E., and Holm-Hansen, O. Salps and ecosystem dynamics in the Antarctic Peninsula Region. *In press*. Deep-Sea Research.

Loeb, V., Siegel, V., Holm-Hansen, O., Hewitt, R., Fraser, W., Trivelpiece, W., and Trivelpiece, S. 1997. Effects of sea-ice extent and krill or salp dominance on the Antarctic food web. *Nature* 387: 897-900.

Makarov., R.R., and Denys, C.J.I. 1981. Stages of sexual maturity of *Euphausia superba*. BIOMASS Handbook 11.

Siegel, V. 1988. A concept of seasonal variation of krill (*Euphausia superba*) distribution and abundance west of the Antarctic Peninsula. *In*: D. Sahrhage (ed.) Antarctic Ocean and Resources Variability. Springer-Verlag, Berlin. Pp. 219-230.

Siegel, V., de la Mare, W.K., and Loeb, V. 1997. Long-term monitoring of krill recruitment and abundance indices in the Elephant Island area (Antarctic Peninsula). *CCAMLR Science* 4: 19-35.

Ward, P., Atkinson, A., Schnack-Schiel, S.G., and Murray, A.W.A. 1997. Regional variation in the life cycle of *Rhincalanus gigas* (Copepoda: Calanoida) in the Atlantic Sector of the Southern Ocean - a re-examination of existing data (1928 to 1993). *Marine Ecology Progress Series* 157: 261-275.

Table 4.1. AMLR 2001 Large-area survey IKMT station information.
Double lines denote subarea divisions.

A. SURVEY A

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
SOUTH AREA										
A001	15/01/01	2349	0019	N	171	2845.9	6	2.1	1332	468.0
A134	16/01/01	0310	0337	T	171	2566.2	117	45.6	1175	457.9
A133	16/01/01	0615	0646	D	171	2699.0	1104	409.0	756	280.1
A121	16/01/01	0927	0955	D	171	2499.8	1350	540.0	21	8.4
A005	16/01/01	1303	1330	D	172	2686.4	35	13.0	203	75.6
A003	16/01/01	1549	1610	D	113	2040.6	46	22.5	155	76.0
A007	16/01/01	2004	2033	D	171	2661.9	12	4.5	141	53.0
A109	16/01/01	2342	0010	N	172	2454.7	3	1.2	2988	1217.3
ELEPHANT ISLAND AREA										
A084	17/01/01	1038	1105	D	171	2536.7	15	5.9	1210	477.0
A085	17/01/01	1418	1446	D	171	2647.8	133	50.2	3042	1148.9
A086	17/01/01	1719	1743	D	170	2211.6	76	34.4	718	324.6
A087	17/01/01	2013	2038	D	173	1950.1	35	17.9	711	364.6
A088	17/01/01	2250	2318	N	172	2725.2	53	19.4	5508	2021.1
A089	18/01/01	0139	0206	N	170	2821.8	9	3.2	2478	878.2
A090	18/01/01	0430	0456	T	169	2368.9	51	21.5	2515	1061.7
A091	18/01/01	0721	0748	D	177	2466.6	196	79.5	1901	770.7
A076	18/01/01	1004	1033	D	169	2675.4	148	55.3	2605	973.7
A078	18/01/01	1428	1452	D	173	2248.4	26	11.6	547	243.3
A079	18/01/01	1720	1748	D	170	2274.7	103	45.3	1228	539.9
A081	18/01/01	2146	2215	D	170	2421.6	3	1.2	2780	1148.0
A083	19/01/01	0141	0211	N	171	2954.7	6	2.0	4161	1408.3
A068	19/01/01	0437	0503	T	169	2665.2	11	4.1	326	122.3
A069	19/01/01	0736	0804	D	170	2476.6	11	4.4	318	128.4
A070	19/01/01	1021	1051	D	168	2687.4	3	1.1	401	149.2
A071	19/01/01	1325	1355	D	171	2361.9	357	151.1	1207	511.0
A072	19/01/01	1627	1653	D	174	2441.2	123	50.4	1329	544.4
A073	19/01/01	1916	1943	D	171	2522.9	16	6.3	800	317.1
A074	19/01/01	2201	2230	N	171	2483.5	4	1.6	3451	1389.6
A075	20/01/01	0053	0122	N	171	2547.8	81	31.8	1290	506.3
A060	20/01/01	0349	0418	T	170	2635.6	0	0.0	3003	1139.4
A062	20/01/01	0810	0840	D	170	2721.4	171	62.8	983	361.2
A064	20/01/01	1229	1257	D	172	2347.1	7	3.0	1062	452.5
A065	20/01/01	1720	1745	D	161	2146.4	2	0.9	1212	564.7
A067	20/01/01	2135	2202	N	170	2457.5	0	0.0	1772	721.0
A052	21/01/01	0059	0127	N	171	2471.1	27	10.9	2138	865.2
A053	21/01/01	0358	0425	T	171	2601.8	2	0.8	5780	2221.5
A054	21/01/01	0625	0636	D	50	1023.8	1	1.0	394	384.8
A055	21/01/01	0857	0908	D	59	990.8	0	0.0	539	544.0
A056	21/01/01	1141	1210	D	169	2719.1	592	217.7	3717	1367.0
A057	21/01/01	1441	1509	D	171	2674.6	23	8.6	514	192.2
A058	21/01/01	1730	1755	D	170	2402.7	29	12.1	2180	907.3
A059	21/01/01	2020	2048	D	169	2473.8	9	3.6	495	200.1
A044	21/01/01	2310	2337	N	174	2317.9	4	1.7	877	378.4
A046	22/01/01	0346	0415	T	172	2569.8	206	80.2	2184	849.9
A047	22/01/01	0651	0715	D	170	2310.8	75	32.5	2683	1161.1
A049	22/01/01	1043	1104	D	145	1774.9	3	1.7	890	501.4
A051	22/01/01	1505	1532	D	170	2617.2	109	41.6	148	56.5
A036	22/01/01	1758	1822	D	170	2367.6	44	18.6	339	143.2
A037	22/01/01	2014	2044	D	171	2890.6	22	7.6	265	91.7
A038	22/01/01	2234	2312	N	172	2343.0	14	6.0	823	351.3
A039	23/01/01	0137	0205	N	171	2491.5	0	0.0	1054	423.0
A040	23/01/01	0430	0501	T	170	2692.7	0	0.0	450	167.1
A041	23/01/01	0728	0753	D	169	2359.9	14	5.9	396	167.8
A042	23/01/01	1002	1031	D	172	2640.6	21	8.0	1041	394.2
A043	23/01/01	1252	1319	D	172	2778.8	7	0.1	1168	420.3
A025	23/01/01	1550	1619	D	171	2500.4	0	0.0	1118	447.1
A027	23/01/01	2020	2049	D	171	2842.0	28	9.9	1253	440.9
A029	24/01/01	0054	0124	N	171	2830.1	1	0.4	2228	787.3
A030	24/01/01	0407	0434	T	170	2651.0	14	5.3	1197	451.5

Table 4.1. (Contd.).

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
A032	24/01/01	0816	0846	D	170	2633.1	42	16.0	202	76.7
A017	24/01/01	1056	1125	D	169	2694.8	75	27.8	278	103.2
A018	24/01/01	1339	1409	D	170	2738.3	58	21.2	622	227.1
A019	24/01/01	1630	1700	D	170	2525.6	13	5.1	618	244.7
A020	24/01/01	1925	1949	D	171	2194.2	13	5.9	580	264.3
A021	24/01/01	2205	2235	N	171	2617.2	13	5.0	4226	1614.7
A022	25/01/01	0101	0128	N	170	2461.5	41	16.7	1180	479.4
A023	25/01/01	0359	0428	T	170	2776.5	1	0.4	1200	432.2
A024	25/01/01	0653	0718	D	170	2157.7	4	1.9	627	290.6
WEST AREA										
A187	25/01/01	1607	1635	D	169	2733.3	2	0.7	2314	846.6
A186	25/01/01	1935	2001	D	170	2310.6	0	0.0	1029	445.3
A105	25/01/01	2256	2319	N	170	2444.0	1	0.4	936	383.0
A104	26/01/01	0230	0302	N	169	3004.5	1	0.3	5040	1677.5
A010	26/01/01	0557	0626	D	169	2502.2	74	29.6	155	61.9
A013	26/01/01	0900	0927	D	170	2485.1	1	0.4	128	51.5
A016	26/01/01	1235	1304	D	171	3031.0	212	69.9	1117	368.5
A110	26/01/01	1623	1648	D	171	2397.2	31	12.9	1374	573.2
A111	26/01/01	2058	2120	D	170	2593.1	0	0.0	2832	1092.1
A188	27/01/01	0133	0202	N	171	2735.8	0	0.0	1035	378.3
A125	27/01/01	0523	0553	D	170	2336.9	4	1.7	181	77.5
A124	27/01/01	0856	0922	D	170	2392.7	7	2.9	528	220.7
A123	27/01/01	1215	1244	D	171	2778.6	39	14.0	455	163.8
A116	27/01/01	1546	1615	D	170	2856.9	173	60.6	548	191.8
A014	27/01/01	1936	1959	D	145	2085.4	0	0.0	377	180.8
A135	27/01/01	2220	2248	N	169	2617.5	61	23.3	1424	544.0
A136	28/01/01	0207	0232	N	170	2727.3	0	0.0	1300	476.7
A137	28/01/01	0546	0613	D	169	2572.4	12	4.7	661	257.0
A138	28/01/01	0914	0944	D	171	2853.2	112	39.3	681	238.7
A153	28/01/01	1240	1309	D	171	2670.5	38	14.2	521	195.1
A152	28/01/01	1631	1659	D	170	2435.7	17	7.0	191	78.4
A151	28/01/01	2008	2039	D	170	2775.1	30	10.8	325	117.1
A150	28/01/01	2318	2337	N	115	1940.0	1	0.5	647	333.5
A164	29/01/01	0323	0352	T	169	2674.8	90	33.6	847	316.7
A165	29/01/01	0659	0729	D	170	2687.4	4	1.5	2088	777.0
A166	29/01/01	1020	1048	D	169	2727.5	3	1.1	617	226.2
A176	29/01/01	1344	1411	D	171	2655.7	3	1.1	852	320.8
A175	29/01/01	1705	1728	D	171	2544.3	23	9.0	530	208.3
A174	29/01/01	2000	2027	D	171	2485.5	110	44.3	2123	854.2
A179	29/01/01	2240	2308	T	170	2576.0	3	1.2	1074	416.9
SOUTH AREA										
A180	30/01/01	0139	0210	N	171	2950.1	596	202.0	572	193.9
A190	30/01/01	0456	0521	T	170	2398.7	72	30.0	385	160.5
A191	30/01/01	0804	0834	D	170	2611.6	21	8.0	255	97.6

		KRILL TOTAL	KRILL #/1000M3	SALP TOTAL	SALP #/1000M3
SURVEY AREA A		7559		127589	
N=101	MEAN		28.7		505.7
	STD		73.3		441.0
	MEDIAN		6.0		383.0
WEST AREA					
N=30	MEAN	1052	12.8	31930	402.4
	STD		18.7		346.2
	MEDIAN		2.3		318.7
ELEPHANT AREA		3145		89962	
N=60	MEAN		20.7		598.6
	STD		36.7		473.4
	MEDIAN		6.0		449.3
SOUTH AREA		3362		7983	
N=11	MEAN		116.2		280.7
	STD		179.6		331.5
	MEDIAN		22.5		160.5

Table 4.1. (Contd.).

B. SURVEY D

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
WEST AREA										
D174	12/02/01	0610	0636	D	170	2312.1	13	5.6	1072	463.6
D175	12/02/01	0945	1015	D	171	2764.7	38	13.7	381	137.8
D176	12/02/01	1309	1337	D	168	2836.9	8	2.8	795	280.2
D166	12/02/01	1637	1700	D	170	2307.2	3	1.3	738	319.9
D165	12/02/01	1959	2927	D	170	2482.9	13	5.2	259	104.3
D164	12/02/01	2320	2348	N	168	2485.6	101	40.6	1044	420.0
D150	13/02/01	0310	0330	N	117	1867.6	805	431.0	201	107.6
D151	13/02/01	0643	0706	D	171	2161.7	25	11.6	891	412.2
D152	13/02/01	1040	1107	D	173	2515.4	14	5.6	960	381.6
D153	13/02/01	1459	1527	D	170	2721.7	7	2.6	1008	370.4
D138	13/02/01	1922	1946	D	170	2177.9	131	60.2	432	198.4
D137	13/02/01	2328	2355	N	169	2710.1	30	11.1	1540	568.2
D136	14/02/01	0319	0349	N	169	2896.0	21	7.3	634	218.9
D135	14/02/01	0641	0704	D	170	2229.3	180	80.7	589	264.2
D014	14/02/01	1105	1129	D	142	2307.8	0	0.0	38	16.5
D116	14/02/01	1444	1513	D	170	2674.3	15	5.6	1040	388.9
D123	14/02/01	1802	1827	D	171	2277.8	4	1.8	228	100.1
D124	14/02/01	2120	2148	N	169	2592.7	5	1.9	1408	543.1
D125	15/02/01	0205	0229	N	169	2587.3	7	2.7	119	46.0
D188	15/02/01	1310	1339	D	170	2921.9	1	0.3	999	341.9
D111	15/02/01	1651	1714	D	172	2139.0	6	2.8	237	110.8
D110	15/02/01	2027	2054	D	173	2590.1	2	0.8	273	105.4
D016	15/02/01	2352	0021	N	170	3316.6	689	207.7	651	196.3
D013	16/02/01	0305	0335	N	170	2327.6	275	118.1	299	128.5
D010	16/02/01	0632	0721	D	171	2746.9	0	0.0	450	163.8
D104	16/02/01	1018	1047	D	171	2825.6	42	14.9	1558	551.4
D105	16/02/01	1334	1404	D	170	3043.3	15	4.9	223	73.3
D186	16/02/01	1653	1722	D	170	2891.0	0	0.0	425	147.0
D187	16/02/01	2015	2045	D	170	2826.5	0	0.0	183	64.7
ELEPHANT ISLAND AREA										
D024	17/02/01	0610	0635	D	170	2324.5	677	291.2	15	6.5
D023	17/02/01	0901	0930	D	170	2749.1	23	8.4	222	80.8
D022	17/02/01	1150	1218	D	169	2877.9	7	2.4	444	154.3
D021	17/02/01	1427	1545	D	171	2450.2	0	0.0	149	60.8
D020	17/02/01	1703	1729	D	172	2614.5	9	3.4	1255	480.0
D019	17/02/01	1941	2009	D	169	2753.4	5	1.8	706	256.4
D018	17/02/01	2220	2247	N	170	2668.3	357	133.8	645	241.7
D017	18/02/01	0045	0114	N	170	3025.2	156	51.6	2060	681.0
D032	18/02/01	0331	0400	N	172	2598.4	12	4.6	877	337.5
D030	18/02/01	0754	0820	D	170	2390.1	1	0.4	933	390.4
D029	18/02/01	1047	1115	D	170	2595.2	0	0.0	907	349.5
D027	18/02/01	1503	1530	D	171	2377.1	0	0.0	1228	516.6
D025	18/02/01	1829	1853	D	171	2471.8	4	1.6	82	33.2
D043	18/02/01	2158	2224	N	170	2332.1	55	23.6	267	114.5
D042	19/02/01	0041	0108	N	171	3361.2	89	26.5	401	119.3
D041	19/02/01	0317	0345	N	170	2620.5	38	14.5	858	327.4
D040	19/02/01	0556	0619	D	170	2170.9	0	0.0	280	129.0
D039	19/02/01	0843	0910	D	171	2571.1	4	1.6	610	237.3
D038	19/02/01	1110	1136	D	171	2485.5	12	4.8	688	276.8
D037	19/02/01	1339	1407	D	171	2854.4	33	11.6	1113	389.9
D036	10/02/01	1622	1648	D	170	2486.9	10	4.0	512	205.9
D051	19/02/01	1845	1910	D	171	2492.1	0	0.0	448	179.8
D049	19/02/01	2234	2259	N	150	2242.2	12	5.4	768	342.5
D047	20/02/01	0235	0305	N	170	2604.2	7336	2817.0	1029	395.1
D046	20/02/01	0515	0542	T	170	2428.4	57	23.5	1112	457.9
D044	20/02/01	0921	0948	D	169	2541.0	6	2.4	793	312.1
D059	20/02/01	1218	1245	D	170	2538.4	3	1.2	108	42.5
D058	20/02/01	1513	1541	D	171	2705.1	17	6.3	265	98.0
D057	20/02/01	1803	1828	D	170	2222.0	35	15.8	275	123.8

Table 4.1. (Contd.).

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
D053	21/02/01	2345	0011	N	168	2801.4	7	2.5	533	190.3
D052	22/02/01	0340	0408	N	171	2782.2	60	21.6	3305	1187.9
D067	22/02/01	0652	0718	D	170	2307.1	2	0.9	1276	553.1
D065	22/02/01	1139	1204	D	159	2342.6	0	0.0	487	207.9
D064	22/02/01	1612	1628	D	172	2613.5	9	3.4	1305	499.3
D063	22/02/01	1915	1942	D	172	2588.8	64	24.7	395	152.6
D060	23/02/01	0409	0438	N	169	2850.7	9	3.2	703	246.6
D075	23/02/01	0703	0728	D	170	2444.6	19	7.8	434	177.5
D074	23/02/01	0945	1013	D	170	2568.5	0	0.0	1916	746.0
D073	23/02/01	1231	1259	D	171	2688.0	104	38.7	73	27.2
D072	23/02/01	1514	1541	D	170	2665.0	13	4.9	229	85.9
D071	23/02/01	1755	1819	D	169	2075.8	48	23.1	909	437.9
D070	23/02/01	2040	2110	N	169	2919.1	0	0.0	893	305.9
D069	23/02/01	2323	2351	N	166	2999.8	15	5.0	1409	469.7
D068	24/02/01	0236	0307	N	169	3257.5	1344	412.6	1859	570.7
D083	24/02/01	0504	0535	T	170	3180.7	39	12.3	7687	2416.8
D081	24/02/01	0931	0958	D	170	2458.7	90	36.6	3385	1376.8
D079	24/02/01	1339	1408	D	170	2759.0	45	16.3	1503	544.8
D078	24/02/01	1618	1646	D	169	2863.4	13	4.5	265	92.5
D076	24/02/01	2027	2055	N	169	2621.0	2	0.8	5785	2207.1
D091	24/02/01	2324	2350	N	170	2378.1	706	296.9	1654	695.5
D090	25/02/01	0211	0240	N	169	2976.9	539	181.1	1761	591.6
D089	25/02/01	0508	0535	T	170	2664.0	70	26.3	528	198.2
D088	25/02/01	0800	0828	D	169	2973.6	12	4.0	3835	1289.7
D087	25/02/01	1105	1132	D	171	2616.3	3	1.1	1632	623.8
D086	25/02/01	1404	1432	D	168	2679.6	0	0.0	562	209.7
D085	25/02/01	1657	1723	D	169	3077.2	0	0.0	1037	337.0
D084	25/02/01	1945	2011	T	170	2558.5	0	0.0	4960	1938.6
SOUTH AREA										
D109	26/02/011	0948	1013	D	170	2390.7	0	0.0	1066	445.9
D007	26/02/01	1334	1403	D	171	2681.6	0	0.0	1719	641.0
D003	26/02/01	1729	1754	D	171	2437.9	3	1.2	557	228.5
D005	26/02/01	2058	2123	N	170	2076.6	0	0.0	3041	1464.4
D121	27/02/01	0908	0936	D	170	2971.9	2	0.7	32	10.8
D133	27/02/01	1203	1231	D	169	2622.0	0	0.0	292	111.4
D134	27/02/01	1531	1600	D	169	2815.7	0	0.0	2639	937.2
D001	28/02/01	2129	2158	N	170	2868.5	6	2.1	1229	428.5
D190	02/03/01	0353	0423	N	210	2810.8	78	27.7	429	152.6
D191	02/03/01	0710	0736	D	169	2573.6	2	0.8	523	203.2

		KRILL TOTAL	KRILL #/1000M3	SALP TOTAL	SALP #/1000M3
SURVEY AREA D		14712		99572	
N=96	MEAN		58.9		391.3
	STD		293.4		429.9
	MEDIAN		4.0		270.5
WEST AREA		2450		18675	
N=29	MEAN		35.9		249.1
	STD		86.7		162.1
	MEDIAN		5.2		198.4
ELEPHANT AREA		12171		69370	
N=57	MEAN		86.5		426.6
	STD		387.1		475.6
	MEDIAN		4.9		305.9
SOUTH AREA		91		11527	
N=10	MEAN		3.3		462.3
	STD		8.2		425.2
	MEDIAN		0.3		328.5

Table 4.2. Maturity stage composition of krill collected in the large survey area and three subareas during (A) January and (B) February-March 2001. Advanced maturity stages are proportions of mature females that are 3c-3e in January and 3d-3e in February-March.

A.	*E. superba* January 2001			
Area	Survey A	Elephant I.	West	South
Stage	%	%	%	%
Juveniles	25.6	9.7	0.1	62.9
Immature	10.2	6.2	1.2	20.3
Mature	64.2	84.1	98.8	16.8
Females:				
F2	0.9	0.2	0.1	2.0
F3a	1.2	0.9	0.0	2.4
F3b	8.0	14.6	3.4	3.1
F3c	9.2	13.2	15.4	1.5
F3d	7.4	7.4	18.8	1.7
F3e	2.1	1.3	1.0	2.4
Advanced Stages	67.1	58.5	91.2	50.1
Males:				
M2a	6.5	2.1	0.1	16.2
M2b	1.6	2.1	0.5	1.3
M2c	1.1	1.7	0.6	0.9
M3a	1.3	2.1	0.4	0.5
M3b	35.1	44.6	59.9	5.3
Male:Female	1.6	1.4	1.6	1.8
No. measured	3596	2063	825	514

B.	February-March 2001			
Area	Survey D	Elephant I.	West	South
Stage	%	%	%	%
Juveniles	11.8	13.4	4.2	3.4
Immature	14.2	14.7	11.6	10.6
Mature	74.0	71.9	84.2	86.0
Females:				
F2	0.7	0.7	1.0	0.9
F3a	2.4	2.4	2.6	0.9
F3b	0.4	0.2	1.2	0.0
F3c	2.3	1.5	6.1	10.3
F3d	4.4	3.8	7.2	16.7
F3e	39.0	42.6	20.7	34.7
Advanced Stages	89.5	91.8	73.9	82.0
Males:				
M2a	3.7	4.1	2.1	1.1
M2b	2.8	2.7	3.6	0.0
M2c	6.9	7.3	4.9	8.6
M3a	2.3	2.2	2.5	12.5
M3b	23.1	19.2	43.8	11.7
Male:Female	0.8	0.7	1.5	0.5
No. measured	2592	1739	763	90

Table 4.3. Zooplankton collected during Surveys A and D, January-March, 2001. F(%) is frequency of occurrence. R is rank. N(%) is proportion of total mean abundance contributed by each taxonomic category. (L) and (J) denote larval and juvenile stages.

	JANUARY 2001 N=101						FEBRUARY-MARCH 2001 N=96					
TAXON	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED
Copepods	100.0	1	2247.1	6097.4	58.9	564.9	99.0	1	5915.7	14242.1	66.4	1416.1
Calanoides acutus	97.0		1078.9	5210.7	28.3	128.6	95.8		3894.9	12957.1	43.7	93.4
Metridia gerlachei	91.1		742.4	1362.2	19.5	110.4	94.8		1483.2	2899.6	16.6	142.9
Other copepods	85.1		266.5	524.6	7.0	71.6	36.5		55.5	225.3	0.6	174.8
Calanus propinquus	86.1		132.4	406.0	3.5	32.2	97.9		234.3	398.3	2.6	0.0
Rhincalanus gigas	33.7		20.1	67.3	0.5	0.0	38.5		28.0	108.1	0.3	0.0
Pleuromama robusta	16.8		5.8	19.3	0.2	0.0	11.5		3.7	12.5	0.0	0.0
Pareucheata antarctica	7.9		0.9	6.5	0.0	0.0	61.5		71.5	127.1	0.8	11.4
Haloptilus ocellatus	0.0		0.0	0.0	0.0	0.0	3.1		2.3	17.9	0.0	0.0
Copepodites	0.0		0.0	0.0	0.0	0.0	67.7		142.2	334.0	1.6	28.6
Salpa thompsoni	100.0	2	520.7	511.1	13.7	383.0	100.0	5	392.1	429.8	4.4	274.8
Thysanoessa macrura (L)	85.1	3	458.0	1117.7	12.0	45.9	91.7	2	718.3	1496.7	8.1	209.7
Chaetognaths	84.2	4	174.2	709.2	4.6	27.1	77.1	7	164.5	385.2	1.8	22.5
Euphausia superba (L)	68.3	5	160.2	710.8	4.2	12.5	64.6	3	683.4	3607.1	7.7	10.5
Thysanoessa macrura	93.1	6	73.5	127.6	1.9	28.2	86.5	4	639.0	5617.6	7.2	21.6
Radiolarians	19.8	7	46.1	357.0	1.2	0.0	32.3	6	216.2	1227.1	2.4	0.0
Euphausia frigida	45.5	8	28.8	64.6	0.8	0.0	50.0	9	42.0	91.9	0.5	0.2
Euphausia superba	89.1	9	27.7	72.2	0.7	6.0	79.2	8	59.0	293.4	0.7	4.0
Cyllopus lucasii	87.1	10	22.4	26.5	0.6	13.8	96.9	10	26.6	29.5	0.3	16.3
Vibilia antarctica	98.0	11	16.3	16.1	0.4	12.5	99.0	11	10.9	13.8	0.1	6.3
Ostracods	37.6	12	6.7	19.0	0.2	0.0	20.8	12	10.1	70.6	0.1	0.0
Clio pyramidata	32.7	13	5.9	34.8	0.2	0.0	10.4		0.4	1.6	0.0	0.0
Limacina helicina	51.5	14	4.9	12.5	0.1	0.8	33.3		1.8	7.9	0.0	0.0
Themisto gaudichaudii	66.3	15	4.0	7.7	0.1	1.5	79.2	14	4.3	6.3	0.0	1.6
Spongiobranchaea australis	68.3		2.1	3.0	0.1	1.0	70.8	15	4.1	10.7	0.0	1.3
Tomopteris spp.	45.5		1.9	5.1	0.1	0.0	19.8		0.4	1.3	0.0	0.0
Euphausia triacantha	13.9		1.6	7.8	0.0	0.0	16.7		1.2	4.0	0.0	0.0
Ihlea racovitzai	12.9		1.1	4.4	0.0	0.0	3.1		0.3	2.9	0.0	0.0
Clione limacina	26.7		0.9	3.5	0.0	0.0	16.7		0.9	6.3	0.0	0.0
Hyperiids	12.9		0.7	3.1	0.0	0.0	5.2		0.3	1.7	0.0	0.0
Lepidonotothen larseni (L)	10.9		0.7	3.2	0.0	0.0	14.6		0.2	0.6	0.0	0.0
Polychaetes	7.9		0.7	5.5	0.0	0.0	1.0		0.1	0.8	0.0	0.0
Jellies (unid.)	16.8		0.6	1.9	0.0	0.0	4.2		0.0	0.1	0.0	0.0
Larval fish (unid.)	18.8		0.6	1.6	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Cyllopus magellanicus	30.7		0.5	1.2	0.0	0.0	70.8		2.9	6.0	0.0	0.8
Diphyes antarctica	23.8		0.5	1.7	0.0	0.0	20.8		0.2	0.6	0.0	0.0
Electrona spp. (L)	10.9		0.4	1.8	0.0	0.0	12.5		0.8	3.1	0.0	0.0
Hydromedusae	14.9		0.4	1.4	0.0	0.0	4.2		0.0	0.2	0.0	0.0
Hyperiella dilatata	24.8		0.4	1.1	0.0	0.0	30.2		0.4	0.8	0.0	0.0
Lepidonotothen kempi (L)	7.9		0.4	1.9	0.0	0.0	19.8		0.2	0.7	0.0	0.0
Siphonophores	3.0		0.3	2.8	0.0	0.0	2.1		0.0	0.1	0.0	0.0
Beroe cucumis	20.8		0.3	0.7	0.0	0.0	7.3		0.1	0.3	0.0	0.0
Beroe forskalii	17.8		0.2	0.7	0.0	0.0	10.4		0.0	0.1	0.0	0.0
Dimophyes arctica	10.9		0.2	0.7	0.0	0.0	15.6		0.2	0.5	0.0	0.0
Calycopsis borchgrevinki	4.0		0.2	1.4	0.0	0.0	6.3		0.0	0.2	0.0	0.0
Hyperoche medusarum	5.0		0.1	0.9	0.0	0.0	10.4		0.1	0.3	0.0	0.0
Hyperiella spp.	5.9		0.1	0.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Botrynema brucei	5.0		0.1	0.6	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (J)	4.0		0.1	0.5	0.0	0.0	5.2		0.1	1.1	0.0	0.0
Primno macropa	7.9		0.1	0.3	0.0	0.0	28.1		1.5	4.9	0.0	0.0
Vanadis antarctica	5.0		0.1	0.3	0.0	0.0	1.0		0.0	0.0	0.0	0.0

Table 4.3. (Contd).

	JANUARY 2001						FEBRUARY-MARCH 2001					
TAXON	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED
Scina spp.	1.0		0.1	0.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ctenophores	5.0		0.1	0.2	0.0	0.0	5.2		0.0	0.2	0.0	0.0
Notolepis spp. (L)	2.0		0.0	0.3	0.0	0.0	1.0		0.2	1.5	0.0	0.0
Pelagobia longicirrata	3.0		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Scyphomedusae	2.0		0.0	0.2	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Electrona antarctica	5.9		0.0	0.1	0.0	0.0	5.2		0.0	0.2	0.0	0.0
Cyllopus spp.	2.0		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona carlsbergi	2.0		0.0	0.2	0.0	0.0	6.3		0.0	0.1	0.0	0.0
Sipunculids	3.0		0.0	0.1	0.0	0.0	12.5		0.3	1.0	0.0	0.0
Eusirus perdentatus	1.0		0.0	0.2	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Mysids	1.0		0.0	0.2	0.0	0.0	1.0		0.1	1.0	0.0	0.0
Rhynchonereella bongraini	1.0		0.0	0.1	0.0	0.0	2.1		0.0	0.1	0.0	0.0
Euphausia crystallorphorias	1.0		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cumaceans	1.0		0.0	0.1	0.0	0.0	2.1		0.0	0.3	0.0	0.0
Adult myctophids	1.0		0.0	0.1	0.0	0.0	2.1		0.0	0.1	0.0	0.0
Cephalopods	1.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Hyperia antarctica	1.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Epimeriella macronyx	1.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Maupasia coeca	1.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Orchomene rossi	1.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Notolepis coatsi (L)	1.0		0.0	0.0	0.0	0.0	2.1		0.0	0.4	0.0	0.0
Electrona subaspera	1.0		0.0	0.0	0.0	0.0	2.1		0.0	0.1	0.0	0.0
Gymnoscopelus braueri	1.0		0.0	0.0	0.0	0.0	7.3		0.0	0.2	0.0	0.0
Euphausiid eggs	0.0		0.0	0.0	0.0	0.0	19.8	13	9.3	51.4	0.1	0.0
Polychaetes (unid.)	0.0		0.0	0.0	0.0	0.0	6.3		0.6	2.8	0.0	0.0
Gammarids	0.0		0.0	0.0	0.0	0.0	4.2		0.4	2.6	0.0	0.0
Euphausia spp. (L)	0.0		0.0	0.0	0.0	0.0	1.0		0.4	3.5	0.0	0.0
Pegantha martgon	0.0		0.0	0.0	0.0	0.0	27.1		0.3	0.6	0.0	0.0
Eusirus antarcticus	0.0		0.0	0.0	0.0	0.0	5.2		0.1	0.3	0.0	0.0
Pleurobrachia pileus	0.0		0.0	0.0	0.0	0.0	5.2		0.0	0.2	0.0	0.0
Fish eggs	0.0		0.0	0.0	0.0	0.0	3.1		0.0	0.3	0.0	0.0
Callianira antarctica	0.0		0.0	0.0	0.0	0.0	5.2		0.0	0.2	0.0	0.0
Bylgides pelagica	0.0		0.0	0.0	0.0	0.0	2.1		0.0	0.2	0.0	0.0
Gymnoscopelus nicholsi	0.0		0.0	0.0	0.0	0.0	3.1		0.0	0.1	0.0	0.0
Krefftichthys anderssoni (J)	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.1	0.0	0.0
Chionodraco rastrospinosus (L)	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.1	0.0	0.0
Laodicea undulata	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Orchomene plebs	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Cyphocaris richardi	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Gymnoscopelus bolini	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Limacina spp.	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
Notothenia neglecta (L)	0.0		0.0	0.0	0.0	0.0	1.0		0.0	0.0	0.0	0.0
TOTAL			3812.7	7486.9		1414.9			8910.1	17688.7		2828.9
NO. TAXA	71		21.5	3.8		21.0	83		20.8	4.0		21.0

Table 4.4. Zooplankton composition and abundance in the Elephant Island, West and South areas sampled during (A) January and (B) February-March, 2001. F is frequency of occurrence (%) in N samples. R is rank. N(%) is proportion of total mean zooplankton abundance contributed by each taxon. (L) and (J) denote larval and juvenile stages.

A. SURVEY A	JANUARY 2001																	
	ELEPHANT ISLAND AREA (N=60)						WEST AREA (N=30)						SOUTH AREA (N=11)					
TAXON	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED
Copepods	100.0	1	1003.2	1582.4	46.8	252.2	100.0	1	4922.6	10394.1	64.9	1235.6	100.0	1	1734.8	2198.1	66.4	1194.5
Metridia gerlachei	88.3		488.4	1103.3	22.8	45.5	96.7		1004.6	1390.9	0.0	367.9	90.9		1412.9	2033.1	54.0	173.0
Calanoides acutus	96.7		241.0	392.0	11.2	117.7	100.0		3112.9	9230.8	0.0	223.1	90.9		102.5	104.6	3.9	96.1
Other copepods	83.3		197.5	527.3	9.2	41.8	93.3		464.7	553.1	0.0	256.0	72.7		102.2	125.7	3.9	75.5
Calanus propinquus	80.0		50.4	85.9	2.4	12.5	96.7		317.7	700.3	0.0	71.2	90.9		74.0	45.9	2.8	68.4
Rhincalanus gigas	26.7		20.2	74.8	0.9	0.0	40.0		13.7	30.0	0.0	0.0	54.5		36.9	90.6	1.4	1.5
Pleuromama robusta	15.0		5.5	21.0	0.3	0.0	20.0		6.7	18.1	0.0	0.0	18.2		4.8	10.2	0.2	0.0
Pareucheata antarctica	6.7		0.2	0.6	0.0	0.0	6.7		2.2	11.7	0.0	0.0	18.2		1.2	2.6	0.0	0.0
Salpa thompsoni	100.0	2	622.8	576.4	29.0	449.3	100.0	5	403.8	345.6	5.3	325.1	100.0	3	282.2	331.2	10.8	160.5
Thysanoessa macrura (L)	86.7	3	269.3	608.8	12.6	42.7	93.3	2	995.4	1741.8	13.1	127.1	54.5	7	21.0	36.0	0.8	6.4
Chaetognaths	78.3	4	57.4	110.9	2.7	11.3	90.0	4	461.0	1245.5	6.1	87.7	100.0	6	29.0	22.2	1.1	35.1
Thysanoessa macrura	96.7	5	46.2	49.2	2.2	32.2	86.7	7	49.3	93.2	0.7	9.1	90.9	2	288.8	246.0	11.0	281.8
Euphausia superba (L)	70.0	6	32.8	86.2	1.5	9.0	93.3	3	472.6	1243.8	6.2	66.5	27.3		2.9	6.9	0.1	0.0
Euphausia frigida	38.3	7	23.4	55.9	1.1	0.0	50.0	9	22.0	38.0	0.3	0.4	72.7	5	77.2	121.5	3.0	32.7
Vibilia antarctica	98.3	8	21.1	18.5	1.0	16.6	100.0		8.8	6.1	0.1	7.5	90.9	9	10.6	9.7	0.4	5.4
Cyllopus lucasii	85.0	9	21.0	24.5	1.0	12.3	100.0	8	32.2	30.3	0.4	21.6	63.6		3.1	5.4	0.1	1.0
Euphausia superba	90.0	10	18.9	32.7	0.9	6.0	83.3		12.8	18.7	0.2	2.3	100.0	4	116.2	179.6	4.4	22.5
Ostracods	41.7		5.3	15.4	0.2	0.0	33.3		6.8	18.0	0.1	0.0	27.3	8	13.8	32.9	0.5	0.0
Themisto gaudichaudii	65.0		3.7	5.5	0.2	1.6	86.7		5.9	11.5	0.1	2.7	18.2		0.2	0.5	0.0	0.0
Limacina helicina	46.7		3.0	6.0	0.1	0.0	46.7		7.4	19.1	0.1	0.0	90.9	10	8.7	13.3	0.3	2.9
Tomopteris spp.	41.7		2.4	6.2	0.1	0.0	50.0		1.3	2.8	0.0	0.0	54.5		1.0	2.2	0.0	0.0
Euphausia triacantha	13.3		2.1	9.8	0.1	0.0	20.0		1.1	3.7	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Spongiobranchaea australis	63.3		2.0	2.7	0.1	1.1	76.7		2.8	3.7	0.0	1.6	72.7		0.7	0.7	0.0	0.4
Clio pyramidata	33.3		1.6	3.9	0.1	0.0	33.3	10	14.8	62.5	0.2	0.0	27.3		5.5	9.8	0.2	0.0
Radiolarians	13.3		1.2	3.9	0.1	0.0	40.0	6	152.8	642.4	2.0	0.0	0.0		0.0	0.0	0.0	0.0
Hydromedusae	20.0		0.6	1.7	0.0	0.0	10.0		0.1	0.4	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Larval Fish (unid.)	20.0		0.6	1.7	0.0	0.0	13.3		0.3	1.0	0.0	0.0	27.3		1.1	1.9	0.0	0.0
Diphyes antarctica	20.0		0.6	2.0	0.0	0.0	13.3		0.1	0.4	0.0	0.0	72.7		1.1	1.6	0.0	0.7
Jellies (unid.)	13.3		0.6	1.9	0.0	0.0	26.7		0.8	2.0	0.0	0.0	9.1		0.0	0.1	0.0	0.0
Clione limacina	18.3		0.5	3.3	0.0	0.0	20.0		0.7	2.1	0.0	0.0	90.9		3.1	6.3	0.1	1.2
Hyperiella dilatata	21.7		0.5	1.3	0.0	0.0	23.3		0.3	0.6	0.0	0.0	45.5		0.2	0.3	0.0	0.0
Hyperiids (unid.)	10.0		0.5	2.1	0.0	0.0	23.3		1.6	4.8	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cyllopus magellanicus	21.7		0.4	1.2	0.0	0.0	36.7		0.8	1.5	0.0	0.0	63.6		0.4	0.4	0.0	0.4
Electrona spp. (L)	10.0		0.4	1.9	0.0	0.0	13.3		0.6	1.5	0.0	0.0	9.1		0.6	1.9	0.0	0.0
Ihlea racovitzai	6.7		0.4	1.6	0.0	0.0	3.3		0.2	1.1	0.0	0.0	72.7		7.3	10.6	0.3	2.7
Lepidonotothen larseni (L)	6.7		0.3	1.8	0.0	0.0	10.0		1.0	4.8	0.0	0.0	27.3		1.8	3.6	0.1	0.0
Beroe cucumis	21.7		0.3	0.7	0.0	0.0	6.7		0.1	0.4	0.0	0.0	54.5		0.9	1.1	0.0	0.4
Beroe forskalii	13.3		0.2	0.9	0.0	0.0	20.0		0.2	0.5	0.0	0.0	36.4		0.2	0.4	0.0	0.0
Calycopsis borchgrevinki	3.3		0.2	1.8	0.0	0.0	3.3		0.0	0.1	0.0	0.0	9.1		0.1	0.2	0.0	0.0
Lepidonotothen kempi (L)	3.3		0.2	1.6	0.0	0.0	3.3		0.0	0.1	0.0	0.0	18.2		0.3	0.8	0.0	0.0
Dimophyes arctica	6.7		0.2	0.9	0.0	0.0	13.3		0.2	0.4	0.0	0.0	27.3		0.2	0.3	0.0	0.0
Polychaetes	6.7		0.2	0.8	0.0	0.0	13.3		2.0	9.8	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Scina spp.	1.7		0.1	0.8	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Vanadis antarctica	6.7		0.1	0.4	0.0	0.0	3.3		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella spp.	5.0		0.1	0.5	0.0	0.0	10.0		0.2	0.8	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (J)	3.3		0.1	0.5	0.0	0.0	0.0		0.0	0.0	0.0	0.0	18.2		0.4	1.1	0.0	0.0
Lepidonotothen nudifrons (L)	1.7		0.1	0.5	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Botrynema brucei	5.0		0.1	0.4	0.0	0.0	6.7		0.2	1.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Primno macropa	6.7		0.1	0.2	0.0	0.0	13.3		0.1	0.4	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pelagogobia longicirrata	5.0		0.1	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Scyphomedusae	3.3		0.0	0.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ctenophores	3.3		0.0	0.2	0.0	0.0	3.3		0.0	0.2	0.0	0.0	18.2		0.2	0.5	0.0	0.0
Notolepis spp. (L)	1.7		0.0	0.2	0.0	0.0	3.3		0.1	0.4	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona carlsbergi	1.7		0.0	0.2	0.0	0.0	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Eusirus perdentatus	1.7		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Sipunculids	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.1		0.0	0.1	0.0	0.0
Cumaceans	1.7		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperia antarctica	1.7		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cephalopods	1.7		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona antarctica	1.7		0.0	0.1	0.0	0.0	6.7		0.0	0.1	0.0	0.0	27.3		0.1	0.2	0.0	0.0
Notolepis coatsi	1.7		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum	1.7		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Siphonophores	0.0		0.0	0.0	0.0	0.0	3.3		0.9	5.1	0.0	0.0	18.2		0.1	0.3	0.0	0.0
Hyperoche medusarum	0.0		0.0	0.0	0.0	0.0	13.3		0.4	1.7	0.0	0.0	9.1		0.1	0.4	0.0	0.0
Mysids	0.0		0.0	0.0	0.0	0.0	3.3		0.1	0.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Adult Myctophids (unid.)	0.0		0.0	0.0	0.0	0.0	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cyllopus spp.	0.0		0.0	0.0	0.0	0.0	3.3		0.0	0.1	0.0	0.0	9.1		0.1	0.4	0.0	0.0
Epimeriella macronyx	0.0		0.0	0.0	0.0	0.0	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona subaspera	0.0		0.0	0.0	0.0	0.0	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus braueri	0.0		0.0	0.0	0.0	0.0	3.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Rhynchonereella bongraini	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.1		0.1	0.4	0.0	0.0
Euphausia crystallorphorias	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.1		0.1	0.3	0.0	0.0
Maupasia coeca	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.1		0.0	0.1	0.0	0.0
Orchomene rossi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.1		0.0	0.1	0.0	0.0
TOTAL			2145.7	2253.2		1414.9			7586.1	12487.2		2375.9			2614.4	2507.9		1852.2
NO. TAXA	60		17.4	4.1		17.0	57		20.1	3.7		19.0		47	21.3	2.8		21.0

Table 4.4 (Contd.)

B. SURVEY D	FEBRUARY-MARCH 2001																	
	ELEPHANT ISLAND AREA (N=57)						WEST AREA (N=29)						SOUTH AREA (N=10)					
	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED	F(%)	R	MEAN	STD	N(%)	MED
Copepods	98.2	1	4501.5	8072.4	63.5	1518.0	100.0	1	9636.6	22692.6	68.0	1504.9	100.0	1	3185.9	4841.0	79.0	351.2
Calanoides acutus	94.7		2540.2	6921.6	35.8	111.5	96.6		7869.4	20909.4	55.6	263.7	100.0		90.5	62.8	2.2	64.2
Metridia gerlachei	93.0		1450.0	2966.0	20.4	140.1	96.6		1064.9	1494.9	7.5	259.0	100.0		2885.5	4648.5	71.6	141.5
Calanus propinquus	96.5		247.1	402.9	3.5	122.2	100.0		272.6	438.2	1.9	101.9	100.0		50.6	43.6	1.3	49.0
Copepodites	64.9		116.1	343.8	1.6	23.2	79.3		237.0	348.0	1.7	95.3	50.0		16.4	23.7	0.4	3.0
Pareucheata antarctica	66.7		74.7	137.9	1.1	20.8	41.4		47.6	90.3	0.3	0.0	90.0		122.3	137.2	3.0	74.8
Other copepods	29.8		37.0	188.4	0.5	0.0	37.9		106.3	307.2	0.8	0.0	70.0		13.8	14.7	0.3	7.8
Rhincalanus gigas	38.6		32.4	129.1	0.5	0.0	34.5		27.5	75.6	0.2	0.0	50.0		5.0	8.2	0.1	1.2
Pleuromama robusta	10.5		3.7	13.6	0.1	0.0	13.8		4.2	12.1	0.0	0.0	10.0		1.8	5.4	0.0	0.0
Haloptilus ocellatus	1.8		0.4	2.7	0.0	0.0	6.9		7.0	31.8	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Thysanoessa macrura	89.5	2	1040.9	7262.6	14.7	44.1	75.9		17.1	43.1	0.1	3.8	100.0	3	151.4	121.9	3.8	131.6
Thysanoessa macrura (L)	89.5	3	613.3	1009.5	8.6	265.3	100.0	3	1165.1	2241.4	8.2	358.1	80.0	7	21.0	20.9	0.5	10.8
Salpa thompsoni	100.0	4	452.4	501.2	6.4	312.1	100.0	6	249.1	162.1	1.8	198.4	100.0	2	462.3	425.2	11.5	328.5
Radiolarians	31.6	5	133.6	672.2	1.9	0.0	37.9	4	452.5	2002.9	3.2	0.0	20.0		1.7	4.7	0.0	0.0
Chaetognaths	71.9	6	93.5	173.4	1.3	10.5	86.2	5	349.0	618.0	2.5	53.5	80.0	6	33.9	38.2	0.8	18.8
Euphausia superba	78.9	7	80.5	374.0	1.1	4.6	89.7	8	35.9	86.8	0.3	5.2	50.0		3.3	8.2	0.1	0.3
Euphausia superba (L)	57.9	8	71.9	176.9	1.0	5.1	89.7	2	2119.3	6328.9	15.0	42.5	30.0		4.8	9.8	0.1	0.0
Euphausia frigida	47.4	9	37.7	82.0	0.5	0.0	44.8	7	44.5	111.0	0.3	0.0	80.0	4	59.5	81.8	1.5	4.9
Cyllopus lucasii	96.5	10	30.0	33.5	0.4	16.7	96.6	10	23.3	22.4	0.2	15.4	100.0	8	16.6	16.8	0.4	10.8
Vibilia antarctica	98.2		14.4	16.6	0.2	8.2	100.0		5.9	4.2	0.0	5.0	100.0	10	5.2	4.3	0.1	3.8
Themisto gaudichaudii	82.5		4.5	6.5	0.1	2.1	89.7		5.2	6.6	0.0	1.6	30.0		0.4	0.7	0.0	0.0
Euphausiid eggs	22.8		4.1	10.1	0.1	0.0	3.4		2.8	14.6	0.0	0.0	50.0	5	58.0	146.6	1.4	3.1
Primno macropa	36.8		2.4	6.1	0.0	0.0	20.7		0.5	1.7	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ostracods	21.1		1.9	4.9	0.0	0.0	17.2	9	25.8	126.0	0.2	0.0	30.0	9	11.4	22.7	0.3	0.0
Spongiobranchaea australis	66.7		1.9	2.4	0.0	1.2	86.2		9.7	18.0	0.1	3.0	50.0		0.7	1.2	0.0	0.2
Euphausia triacantha	19.3		1.5	4.4	0.0	0.0	17.2		1.1	3.7	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cyllopus magellanicus	70.2		1.3	1.6	0.0	0.8	75.9		6.7	9.7	0.0	0.8	60.0		1.1	1.4	0.0	0.6
Electrona spp.	19.3		1.3	3.9	0.0	0.0	3.4		0.0	0.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Polychaetes (unid.)	8.8		0.7	3.2	0.0	0.0	3.4		0.5	2.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Euphausia spp. (L)	1.8		0.6	4.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gammarids	3.5		0.4	3.2	0.0	0.0	3.4		0.3	1.5	0.0	0.0	10.0		0.2	0.7	0.0	0.0
Tomopteris spp.	17.5		0.4	1.4	0.0	0.0	24.1		0.4	1.0	0.0	0.0	20.0		0.2	0.5	0.0	0.0
Limacina helicina	21.1		0.3	1.4	0.0	0.0	48.3		4.9	13.7	0.0	0.0	60.0		1.1	1.8	0.0	0.4
Pegantha martgon	33.3		0.3	0.6	0.0	0.0	24.1		0.3	0.7	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Sipunculids	7.0		0.3	1.2	0.0	0.0	3.4		0.0	0.1	0.0	0.0	70.0		0.8	0.9	0.0	0.4
Hyperiella dilatata	26.3		0.3	0.6	0.0	0.0	31.0		0.4	0.9	0.0	0.0	50.0		1.0	1.2	0.0	0.5
Mysids	1.8		0.2	1.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiids	1.8		0.2	1.2	0.0	0.0	6.9		0.4	2.3	0.0	0.0	20.0		0.9	1.8	0.0	0.0
Diphyes antarctica	17.5		0.1	0.4	0.0	0.0	3.4		0.0	0.2	0.0	0.0	90.0		1.1	1.2	0.0	0.4
Dimophyes arctica	14.0		0.1	0.4	0.0	0.0	6.9		0.1	0.6	0.0	0.0	50.0		0.4	0.5	0.0	0.2
Hyperoche medusarum	12.3		0.1	0.4	0.0	0.0	10.3		0.1	0.3	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Clione limacina	5.3		0.1	0.5	0.0	0.0	34.5		2.6	11.2	0.0	0.0	30.0		0.2	0.3	0.0	0.0
Pleurobrachia pileus	8.8		0.1	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Calycopsis borchgrevinki	8.8		0.1	0.3	0.0	0.0	3.4		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus braueri	10.5		0.1	0.2	0.0	0.0	3.4		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen kempi	21.5		0.1	0.2	0.0	0.0	24.1		0.3	0.6	0.0	0.0	50.0		0.8	1.9	0.0	0.2
Beroe cucumis	5.3		0.1	0.3	0.0	0.0	6.9		0.1	0.3	0.0	0.0	20.0		0.1	0.1	0.0	0.0
Electrona carlsbergi	10.5		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Beroe forskalii	10.5		0.0	0.1	0.0	0.0	10.3		0.1	0.2	0.0	0.0	10.0		0.0	0.1	0.0	0.0
Electrona antarctica	5.3		0.0	0.2	0.0	0.0	6.9		0.1	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen larseni	7.0		0.0	0.1	0.0	0.0	13.8		0.2	0.5	0.0	0.0	60.0		1.1	1.3	0.0	0.5
Fish eggs	3.5		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.2	0.6	0.0	0.0
Rhynchonereella bongraini	3.5		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ctenophores	5.3		0.0	0.1	0.0	0.0	6.9		0.1	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (J)	3.5		0.0	0.1	0.0	0.0	6.9		0.4	2.0	0.0	0.0	10.0		0.1	0.2	0.0	0.0
Jellies (unid.)	3.5		0.0	0.1	0.0	0.0	6.9		0.0	0.2	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus nicholsi	5.3		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cumaceans	1.8		0.0	0.1	0.0	0.0	3.4		0.1	0.5	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Clio pyramidata	3.5		0.0	0.1	0.0	0.0	20.7		1.2	2.8	0.0	0.0	20.0		0.1	0.2	0.0	0.0
Krefftichthys anderssoni (J)	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Callianira antarctica	3.5		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	30.0		0.2	0.4	0.0	0.0
Schyphomedusae	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Cephalopods	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Vanadis antarctica	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Siphonophores	1.8		0.0	0.1	0.0	0.0	3.4		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Eusirus perdentatus	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hydromedusae	1.8		0.0	0.1	0.0	0.0	3.4		0.0	0.1	0.0	0.0	20.0		0.2	0.4	0.0	0.0
Laodicea undulata	1.8		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Larval fish (unid.)	1.8		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus bolini	1.8		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Limacina spp.	1.8		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Notothenia neglecta	1.8		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Notolepis spp.	0.0		0.0	0.0	0.0	0.0	3.4		0.5	2.6	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Botrynema brucei	0.0		0.0	0.0	0.0	0.0	3.4		0.0	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ihlea racovitzai	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	30.0		3.2	8.6	0.1	0.0
Eusirus antarcticus	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	50.0		0.6	0.8	0.0	0.2
Notolepis coatsi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	20.0		0.4	1.1	0.0	0.0
Bylgides pelagica	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	20.0		0.2	0.5	0.0	0.0
Adult myctophids	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	20.0		0.1	0.3	0.0	0.0
Electrona subaspera	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	20.0		0.1	0.2	0.0	0.0
Chionodraco rastrospinosus	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.1	0.2	0.0	0.0
Cyphocaris richardi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.0	0.1	0.0	0.0
Orchomene plebs	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	10.0		0.0	0.1	0.0	0.0
TOTAL			7093.7	11637.2		2867.6			14163.4	26804.8		2908.1			4031.7	5051.6		1148.6
NO. TAXA	70		20.2	4.0		21.0	55		20.6	3.0		20.0	52		24.7	3.9		25.0

Table 4.5. Taxonomic composition and characteristics of zooplankton clusters in the large survey areas (A) January and (B) February-March 2001. Abundance is numbers per 1000 m^3. N(%) is proportion of total mean abundance contributed by each taxonomic category. (L) denotes larval stages.

A. SURVEY A	JANUARY 2001														
	CLUSTER 1 (N=24)					CLUSTER 2 (N=48)					CLUSTER 3 (N=29)				
TAXON	RANK	MEAN	STD	N(%)	MEDIAN	RANK	MEAN	STD	N(%)	MEDIAN	RANK	MEAN	STD	N(%)	MEDIAN
(TOTAL COPEPODS)		2132.4	1934.5	(64.0)	1332.4		340.8	744.6	(29.1)	128.8		5497.2	10434.5	(63.9)	1361.7
Calanoides acutus	4	177.3	151.7	5.3	141.6	3	105.9	151.4	9.0	51.5	1	3437.9	9311.1	39.9	515.8
Thysanoessa macrura (L)	8	78.1	129.6	2.3	19.5	4	88.1	199.3	7.5	17.8	2	1385.9	1750.4	16.1	659.8
Metridia gerlachi	1	1759.9	1814.8	52.8	960.3	2	168.1	648.9	14.3	10.7	3	907.9	1321.2	10.5	359.9
Other copepods	5	155.2	133.0	4.7	126.4	7	35.7	54.7	3.1	16.1	4	744.9	781.5	8.7	416.4
Chaetognaths	6	88.1	203.7	2.6	45.1		16.8	28.9	1.4	7.1	5	505.9	1249.1	5.9	160.0
Euphausia superba (L)	10	40.4	71.8	1.2	21.6		15.6	31.1	1.3	3.1	6	500.1	1261.6	5.8	72.5
Salpa thompsoni	2	542.1	408.4	16.3	432.2	1	563.1	625.9	48.1	366.6	7	438.1	343.9	5.1	356.6
Calanus propinquus	7	88.0	94.4	2.6	61.9	8	23.3	47.2	2.0	3.6	8	352.4	702.3	4.1	100.5
Radiolarians		1.2	2.8	0.0	0.0		0.4	1.5	0.0	0.0	9	159.1	652.6	1.8	0.0
Rhincalanus gigas		25.1	64.7	0.8	0.0		4.4	17.9	0.4	0.0	10	42.7	104.8	0.5	0.0
Cyllopus lucasii		17.3	24.7	0.5	9.8		14.3	19.7	1.2	6.5		40.2	29.6	0.5	34.2
Clio pyramidata		4.7	8.9	0.1	0.0		0.9	2.3	0.1	0.0		15.5	63.4	0.2	0.0
Thysanoessa macrura	3	201.1	203.5	6.0	86.6	5	49.5	58.0	4.2	33.6		14.0	27.8	0.2	7.8
Euphausia frigida	9	73.0	82.1	2.2	42.1	10	17.7	61.8	1.5	0.0		12.8	29.4	0.1	0.0
Ostracods		11.0	23.7	0.3	3.0	9	1.9	4.1	1.6	0.0		11.4	26.6	0.1	0.0
Vibilia antarctica		18.1	16.3	0.5	14.2		18.6	17.8	0.2	14.7		10.1	9.4	0.1	7.5
Limacina helicina		3.6	9.4	0.1	1.4		3.3	6.8	0.3	0.0		8.5	19.4	0.1	0.5
Themisto gaudichaudii		4.4	7.3	0.1	1.1		2.6	3.9	0.2	0.7		6.2	11.5	0.1	2.5
Euphausia superba		37.1	89.4	1.1	4.1	6	37.8	81.5	3.2	16.9		4.4	5.0	0.1	1.7
Spongiobranchaea australis		2.5	3.2	0.1	1.1		1.0	1.3	0.1	0.4		3.7	3.9	0.0	2.1
Tomopteris spp.		1.9	4.9	0.1	0.0		1.2	2.7	0.1	0.0		3.2	7.5	0.0	0.7
Clione limacina		1.4	4.6	0.0	0.0		0.2	0.5	0.0	0.0		0.7	2.1	0.0	0.0
Hyperiella dilatata		0.4	1.1	0.0	0.0		0.3	1.1	0.0	0.0		0.5	1.1	0.0	0.0
Cyllopus magellanicus		0.7	1.3	0.0	0.0		0.5	1.3	0.0	0.0		0.5	1.1	0.0	0.0
Beroe cucumis		0.5	1.0	0.0	0.0		0.2	0.6	0.0	0.0		0.2	0.5	0.0	0.0
Diphyes antarctica		0.9	1.8	0.0	0.0		0.3	1.0	0.0	0.0		0.2	0.4	0.0	0.0
TOTAL		3334.2					1171.6					8606.8			

B. SURVEY D	FEBRUARY-MARCH 2001														
	CLUSTER 1 (N=27)					CLUSTER 2 (N=42)					CLUSTER 3 (N=27)				
TAXON	RANK	MEAN	STD	N(%)	MEDIAN	RANK	MEAN	STD	N(%)	MEDIAN	RANK	MEAN	STD	N(%)	MEDIAN
(TOTAL COPEPODS)		5206.3	4157.2	(59.7)	3150.7		322.0	460.1	(24.6)	156.9		15326.3	23787.6	(73.4)	4025.4
Calanoides acutus	3	481.3	900.3	5.5	129.5	4	103.2	154.3	7.9	41.8	1	13206.7	21802.7	63.3	2821.8
Euphausia superba (L)	10	66.6	161.3	0.8	20.8	9	19.9	85.5	1.5	0.0	2	2332.3	6514.7	11.2	145.3
Thysanoessa macrura (L)	5	391.3	501.4	4.5	270.2	2	330.3	700.2	25.2	48.3	3	1648.8	2396.8	7.9	815.9
Metridia gerlachei	1	4294.7	4074.8	49.3	2555.2	3	123.3	330.4	9.4	10.6	4	787.0	1361.8	3.8	202.3
Radiolarians		8.4	39.2	0.1	0.0		0.7	2.5	0.1	0.0	5	759.2	2223.1	3.6	42.7
Calanus propinquus	7	169.8	140.1	1.9	122.2	7	34.2	42.1	2.6	17.1	6	610.2	577.9	2.9	346.9
Chaetognaths		31.0	54.2	0.4	4.6	8	32.8	55.6	2.5	7.9	7	502.8	600.6	2.4	285.7
Copepidites		64.3	69.4	0.7	52.0	6	41.5	102.6	3.2	3.7	8	376.9	546.5	1.8	147.6
Salpa thompsoni	4	476.3	464.0	5.5	337.5	1	466.6	484.9	35.6	342.2	9	191.9	141.8	0.9	129.0
Other copepods		8.3	16.7	0.1	0.0		5.8	13.4	0.4	0.0	10	180.0	397.9	0.9	10.5
Rhincalanus gigas		3.9	13.2	0.0	0.0		2.6	5.4	0.2	0.0		91.8	188.9	0.4	8.4
Pareucheata antarctica	6	171.6	182.2	2.0	97.7		10.4	24.5	0.8	0.0		66.5	86.4	0.3	22.0
Cyllopus lucasii		29.0	36.8	0.3	15.7	10	19.0	20.2	1.4	13.3		36.0	30.2	0.2	27.7
Ostracods		6.3	15.7	0.1	0.0		0.9	2.3	0.1	0.0		28.1	130.3	0.1	0.0
Euphausia superba	8	165.6	529.5	1.9	23.5		18.3	66.1	1.4	2.7		15.6	55.2	0.1	2.4
Spongiobranchaea australis		1.5	2.4	0.0	0.4		1.8	3.3	0.1	0.5		10.4	18.2	0.0	4.3
Vibilia antarctica		12.1	13.1	0.1	8.1		11.2	13.7	0.9	7.2		9.1	14.4	0.0	5.0
Themisto gaudichaudii		4.7	7.0	0.1	1.2		2.8	4.4	0.2	1.1		6.2	7.5	0.0	4.8
Thysanoessa macrura	2	2184.7	10434.2	25.1	68.2	5	52.5	50.6	4.0	35.1		5.6	13.2	0.0	0.5
Primno macropa		0.7	2.6	0.0	0.0		0.3	0.8	0.0	0.0		4.4	8.2	0.0	0.7
Euphausiid eggs		4.6	13.1	0.1	0.0		15.7	75.4	1.2	0.0		4.0	15.9	0.0	0.0
Cyllopus magellanicus		3.5	6.6	0.0	1.4		3.4	6.6	0.3	0.7		1.6	4.0	0.0	0.4
Limacina helicina		0.2	0.4	0.0	0.0		3.3	11.6	0.3	0.0		1.0	2.5	0.0	0.0
Pegantha martgon		0.3	0.6	0.0	0.0		0.1	0.4	0.0	0.0		0.5	0.9	0.0	0.0
Hyperiella dilatata		0.5	1.0	0.0	0.0		0.3	0.8	0.0	0.0		0.4	0.7	0.0	0.4
Euphausia frigida	9	134.7	130.5	1.5	88.2		9.3	25.8	0.7	0.0		0.4	1.9	0.0	0.0
Diphyes antarctica		0.2	0.7	0.0	0.0		0.3	0.7	0.0	0.0		0.0	0.1	0.0	0.0
TOTAL		8716.0					1310.6					20877.6			

Table 4.6. Abundance of krill and other dominant zooplankton taxa collected in the Elephant Island area during January-February and February-March surveys, 1992-2001. Zooplankton data not available for February-March 1992 or January 2000.

	Euphausia superba January-February									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	63	70	63	71	72	71	61	40		60
Mean	23.7	28.8	34.5	9.5	82.1	29.6	27.1	5.3	n.a.	18.9
SD	78.0	64.4	94.2	20.6	245.1	80.5	42.3	8.1	n.a.	32.7
Med	5.7	8.2	3.1	3.6	11.4	5.6	10.2	1.7	n.a.	6.0
Max	594.1	438.9	495.9	146.1	1500.6	483.2	175.0	35.1	n.a.	217.7
	February-March									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	67	67	70	71	72	16	61	39	60	57
Mean	38.0	35.0	17.1	5.2	133.2	30.4	162.6	35.5	14.4	80.5
SD	77.4	89.7	63.5	12.0	867.7	56.4	768.3	155.7	35.3	374.0
Med	7.1	3.0	0.4	1.2	4.1	4.6	4.5	0.8	3.3	4.6
Max	389.9	542.0	371.1	90.0	7385.4	204.2	5667.0	978.6	253.5	2817.0

Thysanoessa macrura January-February									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
63	70	63	71	72	71	61	40		60
48.1	48.6	74.6	104.1	103.4	101.0	135.3	46.6	n.a.	46.2
57.0	60.1	144.3	231.9	118.1	127.2	150.8	54.1	n.a.	49.2
22.5	27.5	25.4	36.1	52.3	52.8	98.0	23.2	n.a.	32.2
233.7	307.1	901.6	1859.0	500.1	616.2	992.3	215.8	n.a.	251.7
February-March									
1992	1993*	1994	1995	1996	1997	1998	1999	2000	2001
	67	70	71	72	16	61	39	60	57
n.a.	128.9	77.1	79.7	116.1	181.3	140.6	95.2	35.1	1040.9
n.a.	235.1	132.6	138.5	147.4	168.0	232.3	131.9	61.5	7262.6
n.a.	22.1	23.8	22.2	53.6	122.6	70.0	18.0	14.0	44.1
n.a.	1141.5	815.9	664.9	679.4	538.9	1638.5	589.2	291.6	55381.1

	Salpa thompsoni January-February									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	63	70	63	71	72	71	61	40		60
Mean	94.3	1213.4	931.9	20.2	25.5	223.2	939.7	197.5	n.a.	622.8
SD	192.3	2536.7	950.2	46.5	36.3	336.4	1556.3	191.6	n.a.	576.4
Med	14.0	245.8	582.3	1.6	10.5	87.1	348.9	159.1	n.a.	449.3
Max	1231.1	16078.8	4781.7	239.9	161.6	2006.3	8030.4	873.4	n.a.	3512.4
	February-March									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	67	67	70	71	72	16	61	39	60	57
Mean	n.a.	1585.9	495.1	20.6	33.2	1245.5	977.3	309.1	912.8	452.4
SD	n.a.	2725.5	579.4	66.5	85.7	1224.6	1496.5	376	3395.1	501.2
Med	n.a.	605.9	242.6	0.7	5.6	521.0	553.8	160.7	262.9	312.1
Max	n.a.	16662.5	2377.5	391.9	659.4	4348.3	10712.9	1550.2	24031.9	2416.8

Copepods January-February									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
63	70	63	71	72	71	61	40		60
n.a	73.5	32.4	741.0	897.5	656.4	41.2	928.2	n.a.	1003.2
n.a	302.7	92.2	1061.3	1726.4	799.1	55.1	1590.8	n.a.	1582.4
n.a	0.0	0.0	346.0	338.2	399.7	21.5	333.0	n.a.	252.2
n.a	2312.6	465.3	7047.5	10598.0	4090.0	276.0	7524.8	n.a.	6909.7
February-March									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
67	67	70	71	72	16	61	39	60	57
n.a.	n.a.	3453.3	3707.3	1483.7	1267.8	110.4	1558.4	8019.1	4501.5
n.a.	n.a.	8190.8	5750.3	2209.2	1755.6	170.3	2337.5	11824.4	8072.4
n.a.	n.a.	172.4	1630.9	970.2	659.8	50.9	621.6	3478.0	1518.0
n.a.	n.a.	37987.2	40998.5	16621.0	7289.2	901.1	10786.6	57498.5	39800.7

Table 4.6. (Contd.)

	Euphausia superba Larvae January-February									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	63	70	63	71	72	71	61	40		60
Mean	n.a.	n.a.	n.a.	172.1	3.4	19.3	0.4	175.1	n.a.	32.8
SD	n.a.	n.a.	n.a.	969.4	8.3	27.0	1.6	795.5	n.a.	86.2
Med	n.a.	n.a.	n.a.	0.0	0.0	6.4	0.0	4.3	n.a.	9.0
Max	n.a.	n.a.	n.a.	8076.1	42.7	96.5	11.4	5083.2	n.a.	654.0
	February-March									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	67	67	70	71	72	16	61	39	60	57
Mean	n.a.	n.a.	n.a.	4593.4	14.1	25.0	2.5	67.2	3423.2	71.9
SD	n.a.	n.a.	n.a.	20117.0	44.0	81.4	18.3	146.0	8974.1	176.9
Med	n.a.	n.a.	n.a.	268.6	3.3	0.0	0.0	12.3	248.7	5.1
Max	n.a.	n.a.	n.a.	167575.6	368.5	339.0	144.1	692.5	44478.2	1197.7

Thysanoessa macrura larvae January-February									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
63	70	63	71	72	71	61	40		60
n.a.	n.a.	n.a.	20.2	372.0	21.5	0.0	116.5	n.a.	269.3
n.a.	n.a.	n.a.	75.2	858.1	38.4	0.0	348.8	n.a.	608.8
n.a.	n.a.	n.a.	0.0	32.1	1.5	0.0	2.8	n.a.	42.7
n.a.	n.a.	n.a.	441.5	4961.8	159.9	0.0	1519.6	n.a.	3621.0
February-March									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
67	67	70	71	72	16	61	39	60	57
n.a.	n.a.	31.7	344.3	511.5	10.8	0.5	185.9	1084.8	613.3
n.a.	n.a.	111.1	594.2	1432.5	24.9	2.0	535.7	4147.3	1009.5
n.a.	n.a.	0.0	79.9	36.1	1.0	0.0	10.0	26.8	265.3
n.a.	n.a.	809.1	3735.5	10875.0	104.7	12.1	2990.8	31132.5	5461.9

	Euphausia frigida January-February									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	63	70	63	71	72	71	61	40		60
Mean	5.4	4.2	4.7	12.1	2.0	9.6	0.3	15.9	n.a.	23.4
SD	14.9	18.4	14.9	32.1	4.5	21.4	1.4	29.1	n.a.	55.9
Med	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	n.a.	0
Max		143.0	76.7	175.6	22.5	91.4	10.0	116.0	n.a.	315.6
	February-March									
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
N	67	67	70	71	72	16	61	39	60	57
Mean	n.a.	1.0	28.9	19.7	9.5	44.8	9.0	23.0	43.1	37.7
SD	n.a.	4.7	62.0	36.7	12.7	54.2	26.0	38.7	73.0	82.0
Med	n.a.	0.0	5.5	2.9	1.2	21.0	0.0	7.6	6.8	0.0
Max	n.a.	32.6	439.7	216.1	48.8	176.2	178.4	159.1	307.2	319.2

Chaetognaths January-February									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
63	70	63	71	72	71	61	40		60
n.a.	3.1	0.2	84.7	11.9	20.1	3.3	63.9	n.a.	57.4
n.a.	7.9	0.5	159.5	25.1	26.1	5.2	159.1	n.a.	110.9
n.a.	0.0	0.0	30.0	4.2	10.3	0.9	14.7	n.a.	11.3
n.a.	41.3	2.2	781.8	184.9	120.4	24.7	960.2	n.a.	660.7
February-March									
1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
67	67	70	71	72	16	61	39	60	57
n.a.	0.7	21.8	330.2	58.4	18.4	8.9	147.4	792.3	93.5
n.a.	4.2	87.7	404.6	72.3	23.9	23.3	261.4	1543.7	173.4
n.a.	0.0	0.0	161.0	31.8	5.5	1.0	48.7	229.4	10.5
n.a.	34.9	578.9	1769.9	383.8	77.9	124.7	1146.6	8221.0	836.9

Table 4.7. Maturity stage composition of krill collected in the Elephant Island area during 2001 compared to 1992-2000. Advanced maturity stages are proportions of mature females that are (A) 3c-3e in January-February and (B) 3d-3e in February-March. Data are not available for January-February, 2000.

A. SURVEY A	ELEPHANT ISLAND AREA KRILL JANUARY-FEBRUARY									
Stage	1992 %	1993 %	1994 %	1995 %	1996 %	1997 %	1998 %	1999 %	2000 %	2001 %
Juveniles	37.1	7.2	4.0	4.6	55.0	15.2	18.4	0.4	n.a.	9.7
Immature	19.1	30.7	18.8	4.0	18.3	30.6	31.7	11.7	n.a.	6.2
Mature	43.9	62.2	77.2	91.4	26.7	54.2	49.9	87.9	n.a.	84.1
Females:										
F2	0.8	7.8	2.3	0.1	1.1	6.3	9.1	1.6	n.a.	0.2
F3a	0.6	11.7	18.0	0.2	0.0	3.5	21.4	1.7	n.a.	0.9
F3b	12.3	14.3	19.3	1.2	0.2	0.6	9.0	1.8	n.a.	14.6
F3c	9.2	5.1	20.1	15.3	1.9	6.9	1.0	14.7	n.a.	13.2
F3d	0.4	1.2	2.3	17.7	0.7	6.1	0.3	23.9	n.a.	7.4
F3e	0.0	0.0	0.0	3.7	11.6	7.4	0.7	9.2	n.a.	1.3
Advanced Stages	42.7	19.5	37.5	96.3	98.3	83.2	6.2	93.2	n.a.	58.5
Males:										
M2a	8.7	6.8	0.3	0.9	14.6	14.6	8.5	2.2	n.a.	2.1
M2b	7.3	11.9	9.4	1.5	2.1	8.2	8.4	3.9	n.a.	2.1
M2c	2.3	4.2	6.8	1.5	0.5	1.5	5.7	4.1	n.a.	1.7
M3a	2.8	3.7	4.3	4.4	1.4	1.5	3.1	1.7	n.a.	2.1
M3b	18.7	26.2	13.2	48.9	10.9	28.1	14.4	34.9	n.a.	44.6
Male:Female ratio	1.7	1.3	0.5	1.5	1.9	1.8	1.0	0.9	n.a.	1.4
No. measured	2472	4283	2078	2294	4296	3209	3600	751	n.a.	2063

B. SURVEY D	FEBRUARY-MARCH									
Stage	1992 %	1993 %	1994 %	1995 %	1996 %	1997 %	1998 %	1999 %	2000 %	2001 %
Juveniles	33.6	3.5	3.7	1.1	20.8	8.0	3.6	0.0	0.1	13.4
Immature	27.1	51.4	6.2	2.5	9.9	19.7	25.4	1.3	2.3	14.7
Mature	39.2	45.1	90.1	96.4	69.3	72.3	71.0	98.7	97.5	71.9
Females:										
F2	0.8	21.8	0.7	0.3	0.6	1.1	6.9	0.0	0.2	0.7
F3a	10.3	12.4	3.5	0.0	0.0	0.1	10.9	0.4	1.0	2.4
F3b	10.2	6.2	7.8	0.0	0.0	0.0	11.8	0.0	0.7	0.2
F3c	4.3	3.7	4.3	2.0	5.0	1.8	3.0	11.1	6.5	1.5
F3d	1.2	1.1	4.6	21.8	10.9	29.1	1.3	47.3	21.9	3.8
F3e	<0.01	1.2	0.9	20.4	4.9	7.3	0.1	4.8	22.0	42.6
Advanced Stages	4.6	9.3	26.1	95.5	76.0	95.0	5.2	81.8	84.2	91.8
Males:										
M2a	4.3	6.9	0.2	0.7	6.5	8.6	1.9	0.0	0.1	4.1
M2b	19.8	19.1	1.2	0.4	1.2	8.8	6.6	0.7	0.7	2.7
M2c	2.2	3.6	4.2	1.1	1.6	1.2	10.0	0.6	1.3	7.3
M3a	2.5	2.1	24.1	4.4	5.3	3.7	17.5	2.6	7.4	2.2
M3b	10.7	18.4	44.7	47.8	43.2	30.3	26.2	32.4	38.0	19.2
Male:Female ratio	1.5	1.1	3.4	1.2	2.7	1.3	1.9	0.6	0.9	0.7
No. measured	3646	3669	1155	1271	2984	560	3153	1176	1371	1739

Table 4.8. Salp and krill carbon biomass (mg C per m^2) in the Elephant Island area during 1994-2001 surveys. N is number of samples. Salp:Krill ratio is based on median values.

	January-February															
	1994		1995		1996		1997		1998		1999		2000		2001	
Biomass	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill
Mean	570.6	314.1	7.8	242.3	20.2	337.3	334.5	229.0	430.8	173.1	151.8	48.6	n.a.	n.a.	334.5	248.5
SD	563.2	856.4	16.1	201.1	30.9	756.1	1116	522.1	565.3	290.6	166.1	66.1	n.a.	n.a.	272.8	425.3
Median	400.5	25.6	1.3	43.5	10.0	72.2	108.9	45.1	187.0	46.7	93.2	14.5	n.a.	n.a.	251.7	81.0
Maximum	3277	4971	75.3	1545	134.2	4721.0	9435	3115.5	2699.0	1488.4	882.7	304.4	n.a.	n.a.	1395.1	2561.2
N	63	63	57	71	72	72	71	71	61	60	40	40	n.a.	n.a.	60	60
Salp:Krill Ratio	15.6		0.03		0.1		2.4		4.0		6.4		n.a.		3.1	

	February-March															
	1994		1995		1996		1997		1998		1999		2000		2001	
Biomass	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill
Mean	483.7	425.9	13.1	59.2	50.7	1702.3	1140	313.1	694.6	1555.8	321.9	451.0	741.2	204.4	333.9	890.3
SD	469.5	2351	47.3	149.1	146.5	12441.6	1270	655.2	1121	8218.7	335.1	2082.6	2314.9	507.6	352.4	4116.8
Median	285.6	2.8	0.7	13.1	4.6	40.7	504.8	50.0	379.4	31.6	193.5	6.9	239.0	42.8	216.3	45.9
Maximum	1844	19314	325.2	1107.1	954.0	106458.5	4645	2639	8543.0	62155.8	1698.1	13133.1	16400.1	3634.6	1702.8	30967.9
N	70	70	71	71	72	72	16	16	61	60	39	39	60	60	57	57
Salp:Krill Ratio	102.0		0.1		0.1		10.1		12.0		28.0		5.6		4.7	

Table 4.9 Zooplankton and nekton taxa present in the large survey area samples during (A) January 2001 and (B) February-March 2001 compared to 1994-2000 surveys. F is the frequency of occurrence (%) in (N) tows. Mean is number per 1000 m^3. n.a. indicates taxon was not enumerated. (L) and (J) denote larval and juvenile stages.

A. SURVEY A	JANUARY -FEBRUARY															
	2001 N=101		2000 N=0		1999 N=75		1998 N=105		1997 N=105		1996 N=91		1995 N=90		1994 N=91	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Copepods	100.0	2247.1	n.a.	n.a.	100.0	711.6	94.2	56.5	100.0	582.6	100.0	794.4	98.9	652.7	30.0	41.3
Salpa thompsoni	100.0	520.7	n.a.	n.a.	100.0	163.3	100.0	808.2	97.1	181.4	64.8	20.4	66.7	16.0	100.0	818.3
Vibilia antarctica	98.0	16.3	n.a.	n.a.	94.7	3.8	96.2	13.2	70.5	2.5	48.4	0.5	22.2	0.2	98.8	11.8
Thysanoessa macrura	93.1	73.5	n.a.	n.a.	93.3	135.1	100.0	180.8	97.1	104.4	98.9	106.9	91.1	96.4	90.0	79.7
Euphausia superba	89.1	27.7	n.a.	n.a.	60.0	6.1	92.3	36.8	93.3	40.4	96.7	112.5	87.8	14.5	77.5	27.1
Cyllopus lucasii	87.1	22.4	n.a.	n.a.	6.7	0.0	20.2	0.5	49.5	0.4	11.0	0.1	22.2	0.5	16.3	0.7
Thysanoessa macrura (L)	85.1	458.0	n.a.	n.a.	69.3	72.5	1.9	0.0	44.8	17.0	90.1	308.5	36.7	15.9	n.a	n.a
Chaetognaths	84.2	174.2	n.a.	n.a.	49.3	47.8	42.3	8.9	74.3	22.9	68.1	12.5	98.9	79.7	n.a	n.a
Euphausia superba (L)	68.3	160.2	n.a.	n.a.	65.3	103.1	11.5	1.0	55.2	15.2	22.0	2.7	22.2	135.8	n.a	n.a
Spongiobranchaea australis	68.3	2.1	n.a.	n.a.	69.3	1.4	45.2	0.9	67.6	2.2	47.3	1.8	64.4	0.5	11.3	0.1
Themisto gaudichaudii	66.3	4.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limacina helicina	51.5	4.9	n.a.	n.a.	61.3	2.4	73.1	8.1	47.6	2.9	74.7	33.7	43.3	1.9	6.3	0.3
Euphausia frigida	45.5	28.8	n.a.	n.a.	32.0	8.9	5.8	0.2	41.9	14.8	30.8	1.9	50.0	9.8	17.5	3.8
Tomopteris spp.	45.5	1.9	n.a.	n.a.	56.0	2.0	31.7	1.3	54.3	1.9	60.4	0.9	84.4	4.2	37.5	2.5
Ostracods	37.6	6.7	n.a.	n.a.	49.3	2.8	51.0	4.8	41.0	5.5	53.8	4.9	56.7	9.7	n.a	n.a
Clio pyramidata	32.7	5.9	n.a.	n.a.	9.3	0.1	4.8	0.3	2.9	0.0	6.6	0.1	72.2	5.3	40.0	5.4
Cyllopus magellanicus	30.7	0.5	n.a.	n.a.	78.7	2.0	64.4	1.9	76.2	3.8	41.8	1.6	24.4	0.2	82.5	6.3
Clione limacina	26.7	0.9	n.a.	n.a.	17.3	0.1	38.5	0.9	21.9	0.3	56.0	2.1	41.1	0.5	13.8	0.3
Hyperiella dilatata	24.8	0.4	n.a.	n.a.	52.0	0.5	39.4	0.4	56.2	2.2	41.8	0.6	54.4	0.3	18.7	0.3
Diphyes antarctica	23.8	0.5	n.a.	n.a.	34.7	0.5	37.5	1.1	9.5	0.2	17.6	0.1	58.9	1.0	20.0	0.3
Beroe cucumis	20.8	0.3	n.a.	n.a.	4.0	0.0	3.8	0.0	15.2	0.1	7.7	0.0	12.2	0.0	15.0	0.1
Radiolaria	19.8	46.1	n.a.	n.a.	40.0	8.9	27.9	0.7	41.0	1.8	12.1	0.1	0.0	0.0	n.a	n.a
Larval fish	18.8	0.6	n.a.	n.a.	9.3	0.1	8.7	0.1	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Beroe forskalii	17.8	0.2	n.a.	n.a.	2.7	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Jellies(unid.)	16.8	0.6	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydromedusae	14.9	0.4	n.a.	n.a.	37.3	0.2	0.0	0.0	20.0	0.1	4.4	0.0	6.7	0.1	0.0	0.0
Euphausia triacantha	13.9	1.6	n.a.	n.a.	17.3	0.4	7.7	0.3	18.1	1.4	15.4	0.5	33.3	1.5	7.5	1.2
Ihlea racovitzai	12.9	1.1	n.a.	n.a.	25.3	3.3	5.8	41.5	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Hyperiids	12.9	0.7	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lepidonotothen larseni (L)	10.9	0.7	n.a.	n.a.	20.0	0.2	23.1	0.5	27.6	1.8	22.0	0.2	40.0	1.1	6.3	0.7
Electrona spp. (L)	10.9	0.4	n.a.	n.a.	24.0	0.2	10.6	0.2	37.1	1.4	27.5	0.7	61.1	2.5	2.5	0.0
Dimophyes arctica	10.9	0.2	n.a.	n.a.	6.7	0.1	2.9	0.1	19.0	0.3	15.4	0.1	25.6	0.8	7.5	0.0
Polychaetes	7.9	0.7	n.a.	n.a.	20.0	0.6	28.8	1.5	1.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Lepidonotothen kempi	7.9	0.4	n.a.	n.a.	6.7	0.0	13.5	0.3	32.4	0.6	30.8	0.3	20.0	0.1	6.3	0.3
Primno macropa	7.9	0.1	n.a.	n.a.	69.3	2.5	26.0	0.7	63.8	4.3	20.9	0.1	20.0	0.1	6.3	0.5
Hyperiella spp.	5.9	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona antarctica	5.9	0.0	n.a.	n.a.	1.3	0.0	3.8	0.1	9.5	0.0	13.2	0.0	13.3	0.1	2.5	0.0
Hyperoche medusarum	5.0	0.1	n.a.	n.a.	5.3	0.0	1.0	0.0	1.0	0.0	3.3	0.0	18.9	0.0	0.0	0.0
Botrynema brucei	5.0	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Vanadis antarctica	5.0	0.1	n.a.	n.a.	5.3	0.1	4.8	0.1	1.0	0.0	4.4	0.0	15.6	0.1	2.5	0.0
Ctenophores	5.0	0.1	n.a.	n.a.	6.7	0.0	3.8	0.1	16.2	0.1	0.0	0.0	6.7	0.0	0.0	0.0
Calycopsis borchgrevinki	4.0	0.2	n.a.	n.a.	2.7	0.0	1.0	0.0	2.9	0.0	2.2	0.0	1.1	0.0	1.3	0.0
Pleuragramma antarcticum (J)	4.0	0.1	n.a.	n.a.	1.3	0.1	4.8	0.0	2.9	0.0	1.1	0.0	2.2	0.0	0.0	0.0
Siphonophores	3.0	0.3	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pelagobia longicirrata	3.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Sipunculids	3.0	0.0	n.a.	n.a.	10.7	0.0	11.5	0.1	10.5	0.1	7.7	0.0	24.4	0.1	0.0	0.0
Notolepis spp. (L)	2.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scyphomedusae	2.0	0.0	n.a.	n.a.	1.3	0.0	1.9	0.0	1.0	0.0	13.2	0.1	0.0	0.0	1.3	0.0
Cyllopus sp.	2.0	0.0	n.a.	n.a.	28.0	0.4	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona carlsbergi	2.0	0.0	n.a.	n.a.	2.7	0.0	1.0	0.0	10.5	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Scina spp.	1.0	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	4.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Eusirus perdentatus	1.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	1.1	0.0	22.2	0.1	0.0	0.0
Mysids	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhynchonereella bongraini	1.0	0.0	n.a.	n.a.	33.3	0.8	9.6	0.2	4.8	0.1	2.2	0.0	3.3	0.1	0.0	0.0
Euphausia crystallorphorias	1.0	0.0	n.a.	n.a.	9.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0
Cumaceans	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	3.8	0.4	1.1	0.0	0.0	0.0	0.0	0.0
Cephalopods	1.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
Hyperia antarctica	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Epimeriella macronyx	1.0	0.0	n.a.	n.a.	0.0	0.0	5.8	0.2	1.9	1.4	1.1	0.0	8.9	0.0	0.0	0.0
Maupasia coeca	1.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	1.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Orchomene rossi	1.0	0.0	n.a.	n.a.	4.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	5.6	0.0	0.0	0.0
Notolepis coatsi (L)	1.0	0.0	n.a.	n.a.	5.3	0.0	3.8	0.0	6.7	0.0	8.8	0.0	27.8	0.1	0.0	0.0
Electrona subaspera	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gymnoscopelus braueri	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 4.9. (Contd.)

A. SURVEY A	JANUARY -FEBRUARY															
	2001		2000		1999		1998		1997		1996		1995		1994	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Acanthepyra pelagica	0.0	0.0	n.a.	n.a.	17.3	0.2	3.8	0.0	9.5	0.1	0.0	0.0	22.2	0.1	0.0	0.0
Euphausia spp. (L)	0.0	0.0	n.a.	n.a.	10.7	11.1	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Bolinopsis infundibulum	0.0	0.0	n.a.	n.a.	5.3	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperiella macronyx	0.0	0.0	n.a.	n.a.	2.7	0.0	2.9	0.1	8.6	0.1	5.5	0.0	23.3	0.1	0.0	0.0
Gammarids	0.0	0.0	n.a.	n.a.	2.7	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Notolepis annulata (L)	0.0	0.0	n.a.	n.a.	2.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0
Decapod larvae	0.0	0.0	n.a.	n.a.	1.3	0.0	2.9	0.0	0.0	0.0	2.2	0.2	0.0	0.0	0.0	0.0
Chionodraco rastrospinosus (L)	0.0	0.0	n.a.	n.a.	1.3	0.0	1.9	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fish Eggs	0.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	2.9	0.1	1.1	0.0	4.4	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	0.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Vogtia serrata	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	3.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Bylgides pelagica	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	2.9	0.1	0.0	0.0	5.6	0.0	0.0	0.0
Periphylla periphylla	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0	0.0	0.0
Notothenia coriiceps	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.3	0.0
Patagonitothen b. guntheri (J)	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaenocephalus aceratus (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchomene plebs	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	2.9	0.0	1.1	0.0	4.4	0.0	1.3	0.0
Bathylagus sp. (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	1.0	0.0	2.2	0.0	8.9	0.0	0.0	0.0
Artedidraco skottsbergi (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperia macrocephala	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.1	1.0	0.0	0.0	0.0	3.3	0.0	1.3	0.0
Eusirus sp.	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bolinopsis sp.	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eusirus antarcticus	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Gymnoscopelus opisthopteris	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	3.8	0.0	2.2	0.0	7.8	0.0	0.0	0.0
Atolla wyvillei	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	2.9	0.0	1.1	0.0	7.8	0.0	0.0	0.0
Krefftichthys anderssoni (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gymnoscopelus nicholsi	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	1.1	0.0	1.1	0.0	0.0	0.0
Cyphocaris richardi	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	4.4	0.0	0.0	0.0
Krefftichthys anderssoni	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Travisiopsis coniceps	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Artedidraco sp. B (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oediceroides calmani	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thyphloscolex muelleri	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0
Chorismus antarcticus	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Cryodraco antarctica (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Artedidraco mirus (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Arctapodema ampla	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Chaenodraco wilsoni (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Travisiopsis levinseni	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Lepidonotothen nudifrons (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	8.9	0.1	1.3	0.2
Hyperiella antarctica	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2	0.0	0.0	0.0
Pegantha martagon	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Phalacrophorus pictus	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Harpagifer antarcticus (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Eusirus microps	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0
Euphysora gigantea	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
Gymnodraco acuticeps (L)	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Gosea brachyura	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0
TOTAL		3812.2		n.a.		1293.7		1172.7		1015.2		1408.9		1052.2		1001.2
NO. TAXA	63		n.a.		65		63		70		66		68		32	

Table 4.9. (Contd.)

B. SURVEY D	FEBRUARY-MARCH															
	2001 N=97		2000 N=97		1999 N=67		1998 N=104		1997 N=16		1996 N=91		1995 N=89		1994 N=89	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Salpa thompsoni	100.0	392.1	96.9	726.2	100.0	248.1	98.1	689.1	100.0	1245.5	62.6	28.2	59.6	16.5	98.9	523.5
Copepods (Total)	99.0	5915.7	99.0	7038.7	100.0	1454.5	97.1	119.0	100.0	1267.8	98.9	1387.0	100.0	3189.1	89.9	3090.2
Vibilia antarctica	99.0	10.9	95.9	20.2	98.5	3.6	96.2	8.0	81.3	8.1	48.4	1.0	23.6	0.2	85.4	6.4
Cyllopus lucasii	96.9	26.6	4.1	0.0	29.9	0.2	57.7	1.6	93.8	2.4	34.1	0.2	23.6	0.5	89.9	6.1
Thysanoessa macrura (L)	91.7	718.3	82.5	883.9	74.6	137.4	13.5	2.6	50.0	10.8	87.9	414.4	79.8	276.9	n.a.	n.a.
Thysanoessa macrura	86.5	639.0	92.8	41.5	98.5	93.1	100.0	177.4	100.0	181.3	91.2	143.3	93.3	161.3	91.0	118.9
Euphausia superba	79.2	59.0	77.3	21.0	61.2	24.4	89.4	133.5	68.8	30.4	86.8	106.7	78.7	5.7	66.3	18.4
Themisto gaudichaudii	79.2	4.3	83.5	7.2	32.8	0.2	32.7	0.3	87.5	2.9	91.2	2.5	74.2	3.6	94.4	11.8
Chaetognaths	77.1	164.5	91.8	632.8	91.0	127.4	61.5	10.7	75.0	18.2	93.4	64.1	100.0	296.4	n.a.	n.a.
Spongiobranchaea australis	70.8	4.1	68.0	2.7	65.7	1.0	38.5	0.8	43.8	2.8	68.1	1.4	60.7	0.4	14.6	0.1
Cyllopus magellanicus	70.8	2.9	87.6	10.0	95.5	4.8	81.7	5.6	93.8	3.3	46.2	2.1	25.8	0.7	79.8	4.4
Euphausia superba (L)	64.6	683.4	80.4	2129.6	80.6	49.8	12.5	1.6	37.5	25.0	62.6	13.9	93.3	3690.0	n.a.	n.a.
Euphausia frigida	50.0	42.0	67.0	49.9	64.2	20.0	29.8	9.3	68.8	44.8	54.9	9.0	60.7	16.7	61.8	25.9
Limacina helicina	33.3	1.8	45.4	205.4	26.9	1.9	37.5	0.8	0.0	0.0	24.2	1.9	4.5	0.0	0.0	0.0
Radiolaria	32.3	216.2	40.2	531.4	40.3	6.3	28.8	1.0	12.5	0.7	34.1	0.9	27.0	0.4	n.a.	n.a.
Hyperiella dilatata	30.2	0.4	22.7	0.4	56.7	1.2	34.6	0.4	25.0	0.2	52.7	0.8	24.7	0.1	36.0	0.6
Primno macropa	28.1	1.5	44.3	3.2	65.7	2.6	49.0	1.9	18.8	0.5	63.7	3.5	31.5	0.4	10.1	0.1
Pegantha martgon	27.1	0.3	13.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ostracods	20.8	10.1	45.4	25.1	80.6	14.0	43.3	5.4	56.3	4.8	47.3	10.1	75.3	43.4	n.a.	n.a.
Diphyes antarctica	20.8	0.2	21.6	0.4	31.3	0.3	29.8	0.4	6.3	0.3	7.7	0.1	23.6	0.4	13.5	0.1
Euphausiid eggs	19.8	9.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tomopteris spp.	19.8	0.4	23.7	2.3	55.2	2.8	8.7	0.0	31.3	0.5	38.5	0.9	57.3	1.3	24.7	0.6
Lepidonotothen kempi (L)	19.8	0.2	29.9	0.3	16.4	0.1	22.1	0.2	6.3	0.2	39.6	0.4	48.3	0.4	6.7	0.1
Euphausia triacantha	16.7	1.2	25.8	1.9	22.4	1.8	11.5	0.6	43.8	0.9	22.0	0.8	28.1	1.6	11.2	1.0
Clione limacina	16.7	0.9	5.2	0.0	3.0	0.0	10.6	0.1	12.5	0.0	15.4	0.2	0.0	0.0	0.0	0.0
Dimophyes arctica	15.6	0.2	15.5	0.6	0.0	0.0	16.3	0.4	12.5	0.1	13.2	0.1	13.5	0.3	10.1	0.0
Lepidonotothen larseni (L)	14.6	0.2	3.1	0.0	11.9	0.0	13.5	0.1	0.0	0.0	13.2	0.3	10.1	0.0	0.0	0.0
Electrona spp. (L)	12.5	0.8	43.3	4.0	20.9	0.3	10.6	0.2	12.5	0.1	38.5	0.9	62.9	5.2	11.2	0.2
Sipunculids	12.5	0.3	12.4	0.1	11.9	0.0	4.8	0.1	6.3	0.0	8.8	0.1	9.0	0.0	3.4	0.0
Clio pyramidata	10.4	0.4	5.2	0.0	13.4	0.1	0.0	0.0	0.0	0.0	3.3	0.0	12.4	0.0	9.0	0.2
Hyperoche medusarum	10.4	0.1	3.1	0.0	4.5	0.0	0.0	0.0	12.5	0.3	2.2	0.0	12.4	0.0	0.0	0.0
Beroe forskalii	10.4	0.0	13.4	0.1	9.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.4	0.1
Beroe cucumis	7.3	0.1	2.1	0.0	9.0	0.0	4.8	0.0	0.0	0.0	11.0	0.1	4.5	0.0	2.2	0.0
Gymnoscopelus braueri	7.3	0.0	8.2	0.1	7.5	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Polychaetes	6.3	0.6	18.6	2.6	7.5	0.3	13.5	0.3	0.0	0.0	3.3	0.1	2.2	0.0	0.0	0.0
Calycopsis borchgrevinki	6.3	0.0	13.4	0.2	19.4	0.4	4.8	0.0	6.3	0.0	6.6	0.0	11.2	0.0	10.1	0.1
Electrona carlsbergi	6.3	0.0	1.0	0.0	4.5	0.0	1.9	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hyperiids (unid)	5.2	0.3	8.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleuragramma antarcticum (J)	5.2	0.1	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.1	0.0	2.2	0.0	0.0	0.0
Eusirus antarcticus	5.2	0.1	1.0	0.0	1.5	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurobrachia pileus	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona antarctica	5.2	0.0	15.5	0.1	6.0	0.0	8.7	0.0	31.3	0.2	20.9	0.2	15.7	0.1	13.5	0.1
Ctenophores	5.2	0.0	6.2	0.1	4.5	0.0	0.0	0.0	6.3	0.0	1.1	0.0	3.4	0.0	0.0	0.0
Callianira antarctica	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gammarids	4.2	0.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydromedusae	4.2	0.0	23.7	0.5	40.3	0.3	12.5	0.2	12.5	0.2	3.3	0.1	5.6	0.0	0.0	0.0
Ihlea racovitzai	3.1	0.3	13.4	0.6	26.9	5.1	61.5	51.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Fish eggs	3.1	0.0	0.0	0.0	1.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	7.9	0.1
Gymnoscopelus nicholsi	3.1	0.0	1.0	0.0	1.5	0.0	1.0	0.0	12.5	0.1	3.3	0.0	1.1	0.0	0.0	0.0
Notolepis coatsi (L)	2.1	0.0	6.2	0.0	0.0	0.0	4.8	0.0	0.0	0.0	18.7	0.1	36.0	0.2	0.0	0.0
Cumaceans	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Bylgides pelagica	2.1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
Rhynchonereella bongraini	2.1	0.0	5.2	0.6	31.3	2.3	1.0	0.0	0.0	0.0	5.5	0.1	20.2	0.1	0.0	0.0
Electrona subaspera	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Siphonophores	2.1	0.0	10.3	2.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Euphausia spp. (L)	1.0	0.4	11.3	4.3	13.4	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notolepis spp. (L)	1.0	0.2	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	5.6	0.0
Mysids	1.0	0.1	1.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Krefftichthys anderssoni (L)	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chionodraco rastrospinosus (L)	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Schyphomedusae	1.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	12.5	0.0	19.8	0.1	13.5	0.1	0.0	0.0
Botrynema brucei	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopods	1.0	0.0	2.1	0.0	4.5	0.0	1.9	0.0	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0
Vanadis antarctica	1.0	0.0	4.1	0.1	1.5	0.0	3.8	0.1	0.0	0.0	1.1	0.0	6.7	0.0	7.9	0.1
Eusirus perdentatus	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.2	0.0	6.7	0.1	0.0	0.0
Laodicea undulata	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Larval fish (unid.)	1.0	0.0	6.2	0.6	14.9	0.7	1.9	0.1	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Cyphocaris richardi	1.0	0.0	3.1	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.4	0.1	0.0	0.0
Orchomene plebs	1.0	0.0	2.1	0.8	0.0	0.0	1.9	0.0	0.0	0.0	2.2	0.0	3.4	0.0	2.2	0.1
Gymnoscopelus bolini	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limacina spp.	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notothenia neglecta	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 4.9. (Contd.)

B. SURVEY D	FEBRUARY-MARCH															
	2001		2000		1999		1998		1997		1996		1995		1994	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Cyllopus spp.	0.0	0.0	25.8	2.9	0.0	0.0	24.0	0.7	24.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Hyperiella spp.	0.0	0.0	9.3	0.3	9.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pelagobia longicirrata	0.0	0.0	5.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gastropods	0.0	0.0	4.1	17.6	6.0	0.5	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausia spp.	0.0	0.0	4.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bolinopsis infundiluus	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leusia sp.	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Epimeriella macronyx	0.0	0.0	2.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	5.6	0.6	0.0	0.0
Scina spp.	0.0	0.0	1.0	0.0	1.5	0.0	0.0	0.0	6.3	0.5	2.2	0.0	1.1	0.0	0.0	0.0
Promyctophum bolini	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solomondella sp.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasiphea sp.	0.0	0.0	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Harpagifer antarcticus	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Orchomene spp.	0.0	0.0	1.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Champsocephalus gunnari (L)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Acanthephyra pelagica (L)	0.0	0.0	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0
Bathylagus antarcticus	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchomene rossi	0.0	0.0	0.0	0.0	1.5	0.0	1.0	0.0	0.0	0.0	5.5	0.5	6.7	0.0	0.0	0.0
Periphylla periphylla	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0	3.4	0.0
Hyperiella macronyx	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	6.3	0.0	6.6	0.1	13.5	0.0	0.0	0.0
Chorismus antarcticus	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gymnoscopelus sp.	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperia macrocephala	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.1	0.0	5.6	0.0	0.0	0.0
Pagothenia brachysoma	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaenodraco wilsoni	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Artedidraco skottsbergi (L)	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhynchonereella sp.	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lepidonothen larseni (J)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Notolepis annulata (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	5.5	0.0	3.4	0.0	0.0	0.0
Eusirus microps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0
Pagetopsis macropterus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Decapod larvae	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Lepidonotothen nudifrons (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.4	0.0	0.0	0.0
Atolla wyvillei	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Bathylagus sp. (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	1.1	0.0	14.6	0.0	0.0	0.0
Travisiopsis coniceps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0	0.0	0.0
Hyperia spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1	0.0	0.0	0.0	0.0
Gymnoscopelus opisthopteris	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	10.1	0.0	2.2	0.0
TOTAL		8910.2		12378.9		2207.6		1224.4		2854.0		2196.4		7713.3		3809.5
NO. TAXA	61		72		57		59		36		62		61		30	

Table 4.10. Percent contribution and abundance rank (R) of numerically dominant zooplankton and nekton taxa in the Elephant Island area during (A) January-February and (B) February-March surveys, 1994-2001. Includes the 10 most abundant taxa each year. No samples were collected during January-February 2000. n.a. indicates that taxon was not enumerated during other surveys. Shaded column is a "salp year".

A. SURVEY A	JANUARY-FEBRUARY ELEPHANT ISLAND AREA															
	1994		1995		1996		1997		1998		1999		2000		2001	
TAXON	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R
Copepods	4.08	3	61.54	1	56.18	1	57.16	1	4.80	3	58.05	1	n.a.		46.76	1
Salpa thompsoni	80.83	1	1.51	5	1.45	6	17.79	2	68.76	1	12.35	2	n.a.		29.03	2
Thysanoessa macrura (L)	n.a.		1.50	6	21.82	2	1.67	6	0.00		7.29	4	n.a.		12.55	3
Chaetognaths	0.04		7.84	4	0.90	7	2.28	5	0.92	7	4.00	5	n.a.		2.68	4
Thysanoessa macrura	7.87	2	9.09	3	7.56	4	10.24	3	15.38	2	2.92	6	n.a.		2.15	5
Euphausia superba (L)	n.a.		12.80	2	0.19	10	1.49	7	0.09		10.95	3	n.a.		1.53	6
Euphausia frigida	0.38	9	0.92	8	0.14		1.45	8	0.02		1.00	7	n.a.		1.09	7
Vibilia antarctica	1.17	5	0.02		0.04		0.24		1.12	6	0.32	9	n.a.		0.98	8
Cyllopus lucasii	0.62	7	0.02		0.11		0.37		0.16	10	0.15		n.a.		0.98	9
Euphausia superba	2.68	4	1.37	7	7.95	3	3.96	4	3.13	5	0.33	8	n.a.		0.88	10
Ostracods	n.a.		0.91	9	0.35	8	0.54	9	0.41	9	0.13		n.a.		0.25	
Themisto gaudichaudii	1.05	6	0.46		0.34	9	0.35		0.03		0.02		n.a.		0.17	
Limacina helicina	0.03		0.18		2.38	5	0.28		0.69	8	0.07		n.a.		0.14	
Tomopteris spp.	0.25	10	0.40		0.06		0.19		0.11		0.15	10	n.a.		0.11	
Euphausia triacantha	0.12		0.14		0.04		0.14		0.02		0.03		n.a.		0.10	
Primno macropa	0.05		0.01		0.01		0.42	10	0.06		0.13		n.a.		0.10	
Spongiobranchaea australis	0.01		0.05		0.13		0.22		0.07		0.09		n.a.		0.09	
Clio pyramidata	0.53	8	0.50	10	0.01		0.00		0.02		0.01		n.a.		0.08	
Ihlea racovitzai	n.a.		n.a.		n.a.		n.a.		3.53	4	0.15		n.a.		0.02	
TOTAL	99.69		99.26		99.64		98.79		99.32		98.15		n.a.		99.68	

B. SURVEY D	FEBRUARY-MARCH ELEPHANT ISLAND AREA															
	1994		1995		1996		1997		1998		1999		2000		2001	
TAXON	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R
Copepods	82.15	1	40.49	2	62.07	1	44.46	1	7.38	4	62.77	1	54.20	1	64.68	1
Thysanoessa macrura	1.83	3	0.87	5	4.86	4	6.36	3	9.40	3	3.84	5	0.24	8	14.96	2
Thysanoessa macrura (L)	n.a.		3.76	3	21.40	2	0.38	8	0.03		7.49	3	7.33	3	8.81	3
Salpa thompsoni	11.78	2	0.22	7	1.39	6	43.62	2	65.31	1	12.46	2	6.17	4	6.50	4
Chaetognaths	0.47	6	3.61	4	2.43	5	0.65	7	0.60	8	5.94	4	5.35	5	1.34	5
Euphausia superba	0.41	7	0.06	10	5.57	3	1.07	5	10.87	2	1.43	7	0.10		1.15	6
Euphausia superba (L)	n.a.		50.16	1	0.59	7	0.88	6	0.16		2.71	6	23.14	2	1.03	7
Euphausia frigida	0.69	5	0.21	8	0.40	8	1.57	4	0.60	7	1.00	8	0.29	7	0.54	8
Cyllopus lucasii	0.14	10	0.01		0.01		0.08		0.14		0.01		0.00		0.43	9
Vibilia antarctica	0.16	9	0.00		0.05		0.28	9	0.71	6	0.15		0.18	10	0.21	10
Themisto gaudichaudii	0.27	8	0.01		0.09		0.10		0.01		0.01		0.02		0.07	
Primno macropa	0.00		0.00		0.15	10	0.02		0.11		0.08		0.02		0.03	
Ostracods	n.a.		0.43	6	0.38	9	0.17	10	0.35	10	0.65	9	0.20	9	0.03	
Euphausia triacantha	0.03		0.02		0.03		0.03		0.04		0.06		0.01		0.02	
Cyllopus magellanicus	0.12		0.01		0.10		0.12		0.55	9	0.17		0.07		0.02	
Electrona spp. (L)	0.75	4	0.07	9	0.04		0.01		0.01		0.01		0.03		0.02	
Limacina helicina	0.00		0.00		0.01		0.00		0.03		0.00		2.21	6	0.00	
Ihlea racovitzai	n.a.		n.a.		n.a.		n.a.		2.77	5	0.34	10	0.00		0.00	
TOTAL	97.93		99.86		99.42		99.66		95.72		98.58		99.57		99.85	

Table 4.11. Percent Similarity Index (PSI) values from comparisons of overall zooplankton composition in the Elephant Island area during Surveys (A) A and (B) D, 1994-2001. Shading denotes the 1998 "salp year".

A	JANUARY-FEBRUARY PSI VALUES						
Year	1995	1996	1997	1998	1999	2000	2001
1994	16.7	16.6	34.2	85.0	20.9	n.a	38.7
1995	xxxxx	70.3	76.8	18.7	80.7	n.a.	58.9
1996		xxxxx	73.4	19.3	70.0	n.a.	65.9
1997			xxxxx	38.4	80.2	n.a.	75.7
1998				xxxxx	22.6	n.a.	39.8
1999					xxxxx	n.a.	75.1
2000						xxxxx	n.a.

B	FEBRUARY-MARCH PSI VALUES						
Year	1995	1996	1997	1998	1999	2000	2001
1994	42.4	66.9	60.1	22.9	78.4	61.8	74.9
1995	xxxxx	49.1	44.0	10.0	52.4	72.0	48.1
1996		xxxxx	54.3	21.1	80.3	67.0	80.9
1997			xxxxx	60.5	65.2	53.6	61.3
1998				xxxxx	27.7	15.5	26.2
1999					xxxxx	76.9	85.0
2000						xxxxx	71.0

Table 4.12. Abundance of biomass dominant copepod species in the Elephant Island area during various cruises 1981-2001. 1981-1990 data provided by John Wormuth (Texas A&M). (N) is number of samples. Abundance is numbers per 1000 m^3.

SURVEY PERIOD		*Calanoides acutus*	*Calanus propinquus*	*Metridia gerlachei*	Total Copepods
Mar 81	Mean	4786.9	5925.8	2402.5	13115.2
(10)	STD	5482.2	6451.6	3321.4	12799.9
	Median	2197.7	2048.7	609.5	8466.8
Feb-Mar 84	Mean	25.5	121.7	1154.4	1301.6
(13)	STD	29.6	134.4	2999.9	3043.9
	Median	16.2	51.4	23.1	96.6
Jan-Feb 88	Mean	429.7	93.6	1639.0	2162.3
(48)	STD	676.8	104.3	3488.0	3928.6
	Median	80.5	45.5	57.0	618.5
Feb 89	Mean	161.4	194.9	3189.3	3545.6
(25)	STD	240.9	151.5	4017.2	4071.5
	Median	88.0	162.0	1051.0	1776.0
Jan 90	Mean	302.5	354.4	981.3	1700.2
(23)	STD	405.8	365.8	1620.7	2003.7
	Median	170.1	243.6	192.3	656.7
Jan 99	Mean	335.4	109.1	340.5	927.0
(40)	STD	1009.5	161.9	512.7	1590.8
	Median	28.9	52.0	66.0	332.9
Feb 99	Mean	511.8	300.9	521.1	1557.9
(39)	STD	1395.6	630.6	699.0	2337.8
	Median	70.7	70.8	216.9	621.6
Feb 00	Mean	1846.3	741.8	3051.7	8019.1
(60)	STD	3177.2	1546.5	4783.5	11824.4
	Median	225.2	193.3	1249.7	3478.0
Jan 01	Mean	241.0	50.4	1003.2	1003.2
(60)	STD	392.0	85.9	1582.4	1582.4
	Median	117.7	12.5	252.2	252.2
Feb-Mar 01	Mean	2540.2	247.1	1450.0	4501.5
(57)	STD	6921.6	402.9	2966.0	8072.4
	Median	111.5	122.2	140.1	1518.0

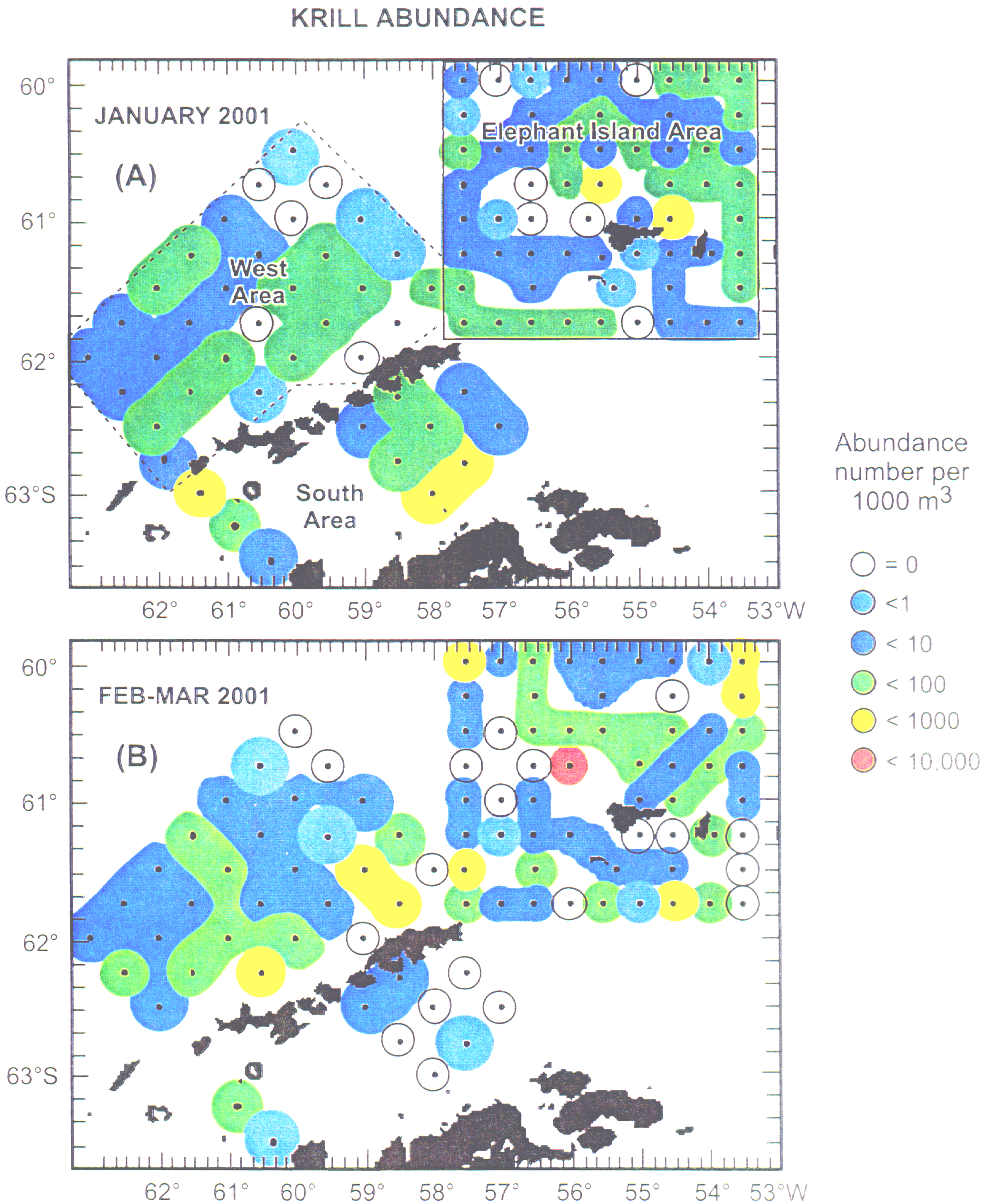

Figure 4.1. Krill abundance in IKMT tows collected during (A) Survey A, January 2001 and (B) Survey D, February-March 2001. The outlined stations are included in the Elephant Island Area and used for between-year comparisons. West and South Area stations are indicated.

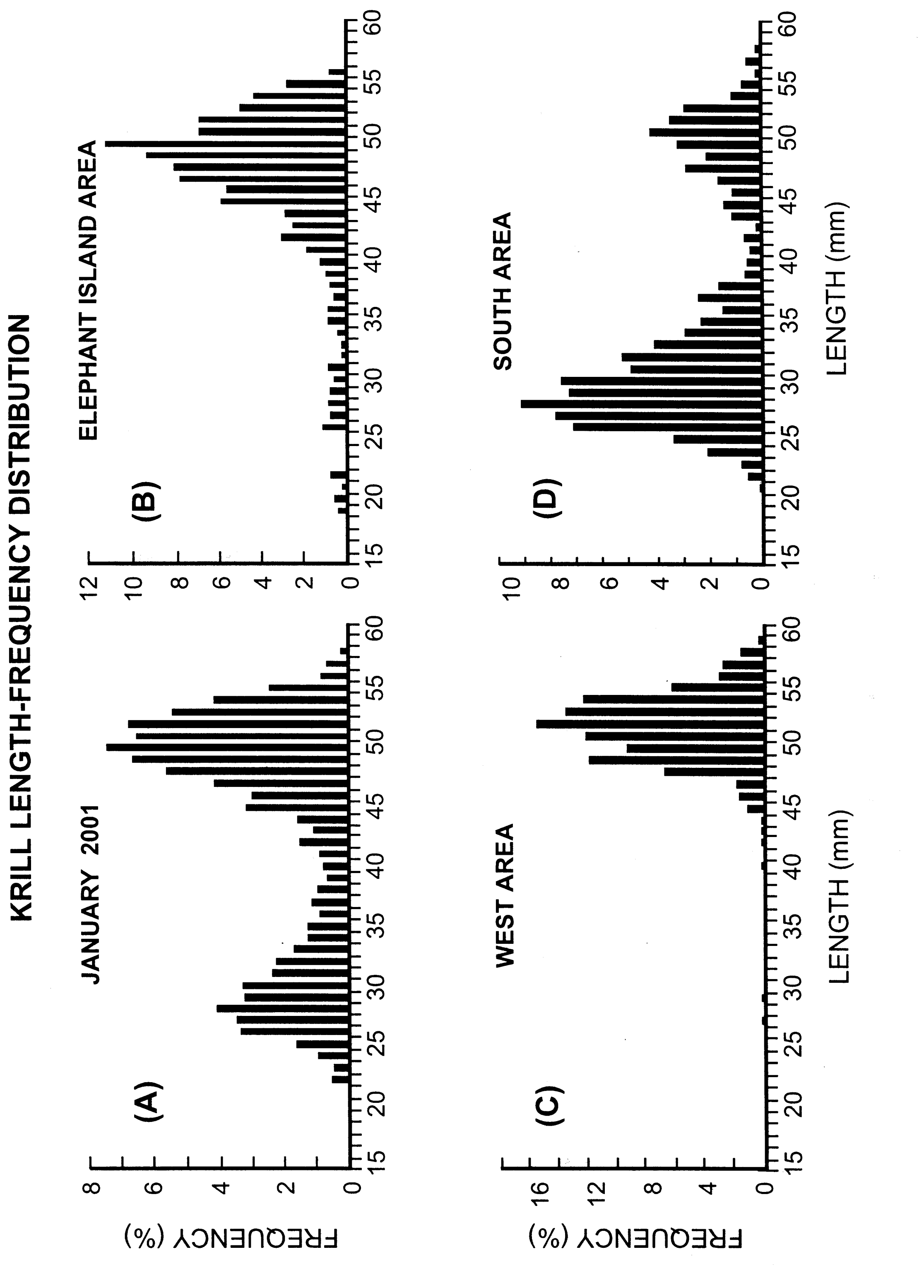

Figure 4.2. Overall length-frequency distribution of krill collected (A) during Survey A and in the (B) Elephant Island Area, (C) West Area and (D) South Area, January 2001.

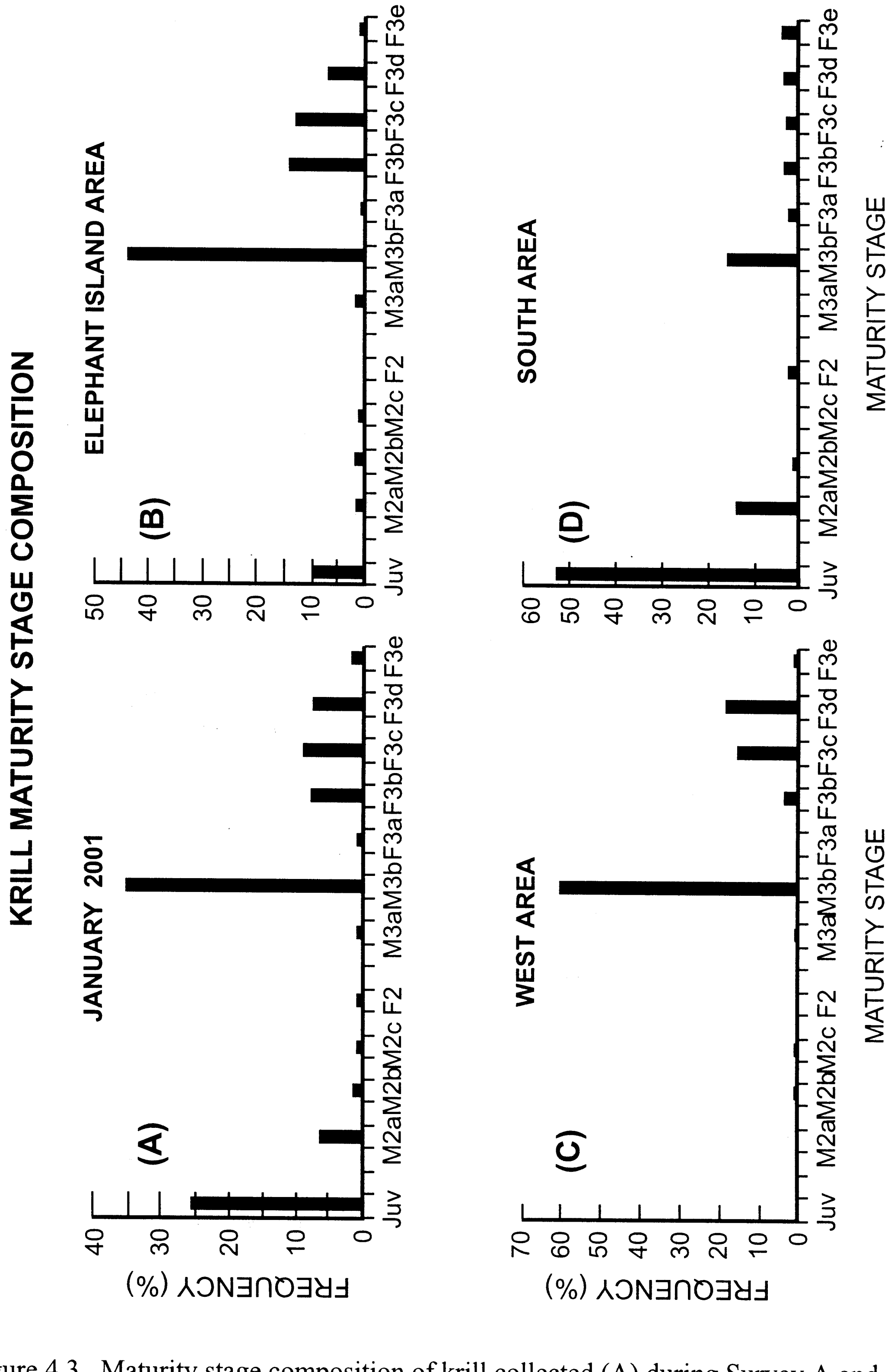

Figure 4.3. Maturity stage composition of krill collected (A) during Survey A and in the (B) Elephant Island Area, (C) West Area and (D) South Area, January 2001.

KRILL CLUSTERS

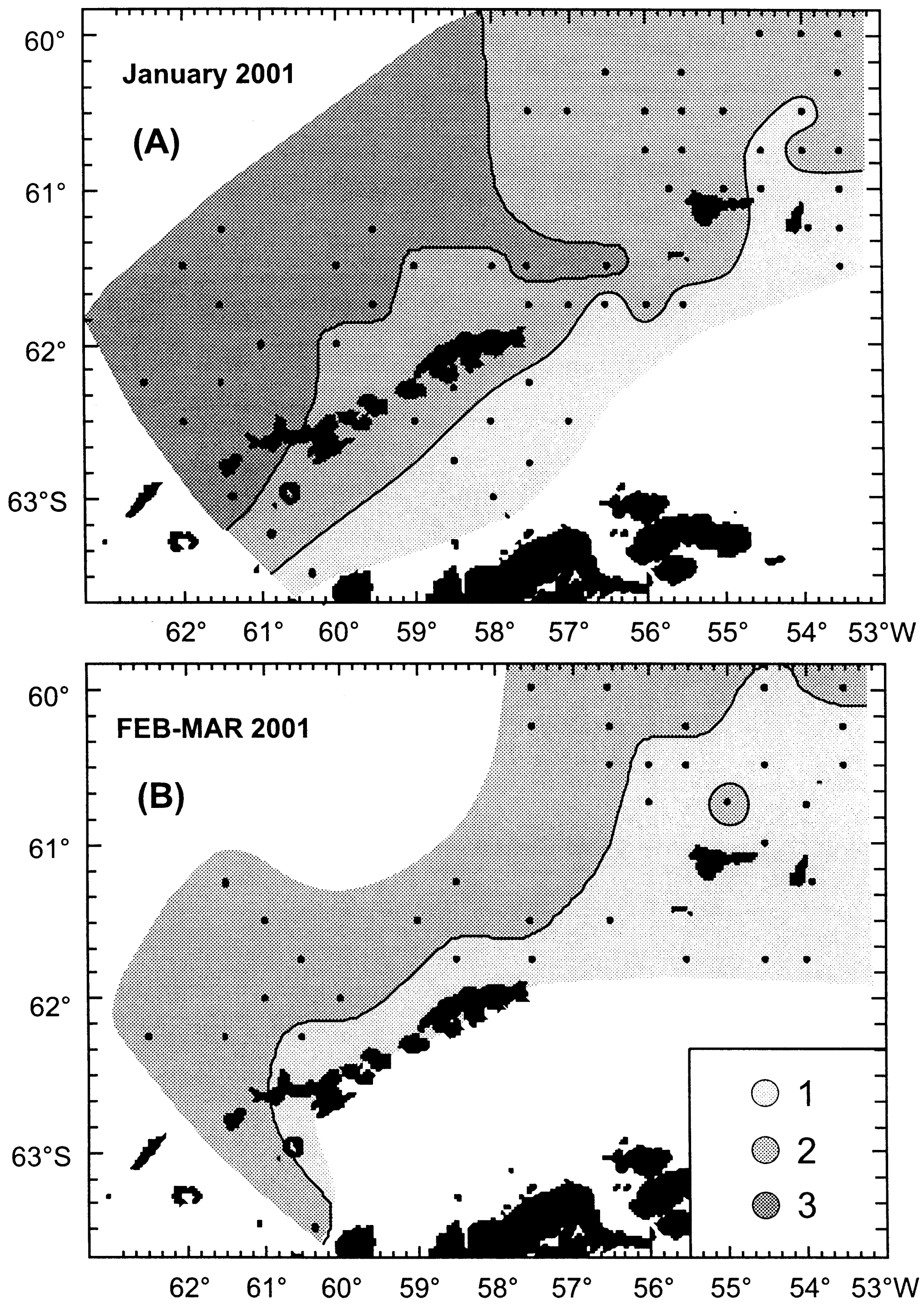

Figure 4.4. Distribution patterns of krill belonging to different length categories within (A) the Survey A Area, January 2001, and (B) the Survey D Area, February-March 2001.

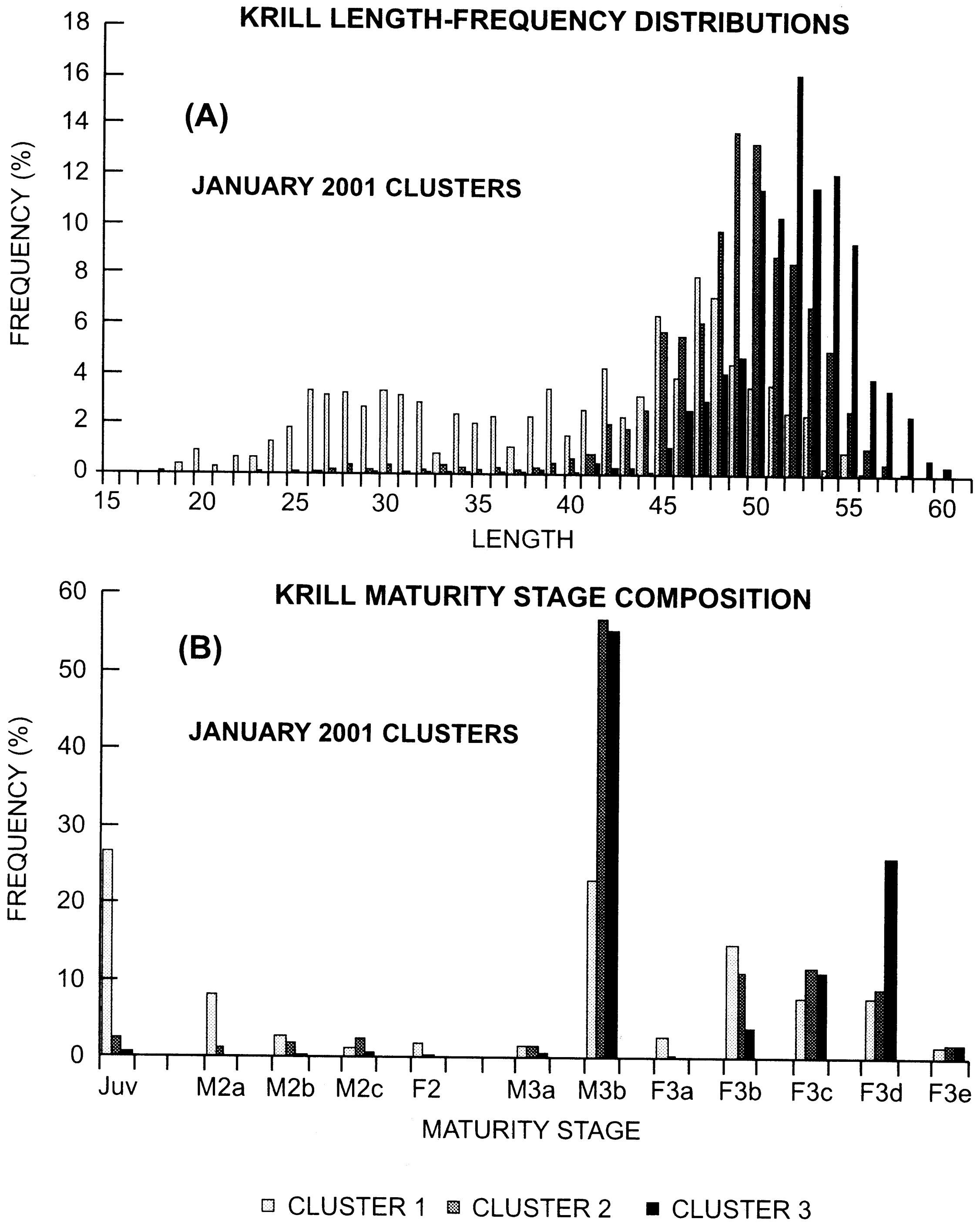

Figure 4.5. (A) Length-frequency distribution and (B) maturity stage composition of krill belonging to three length categories (Clusters 1-3) in the Survey A Area, January 2001.

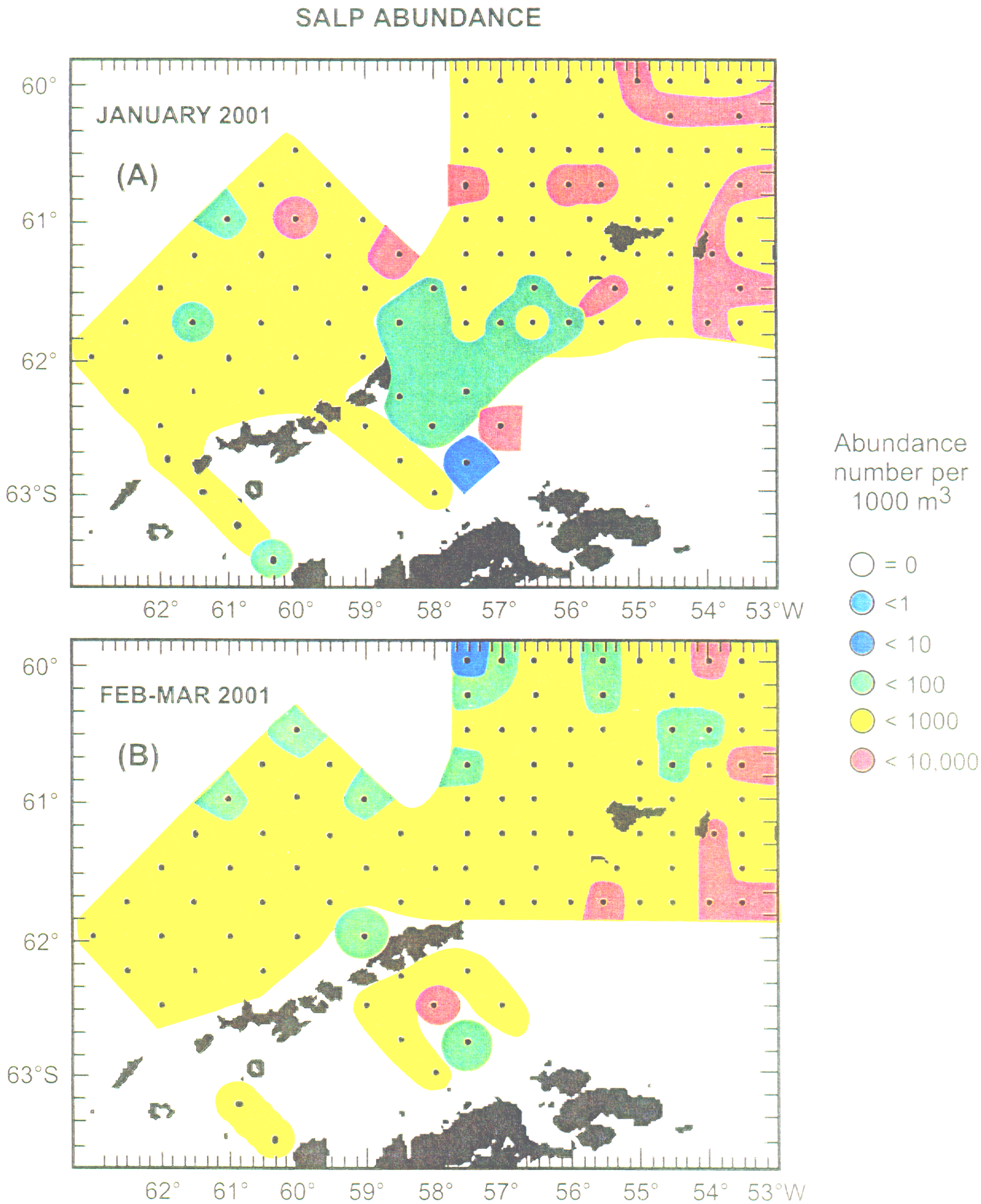

Figure 4.6. Distribution and abundance of *Salpa thompsoni* in the (A) Survey A Area, January 2001 and (B) Survey D Area, February-March 2001

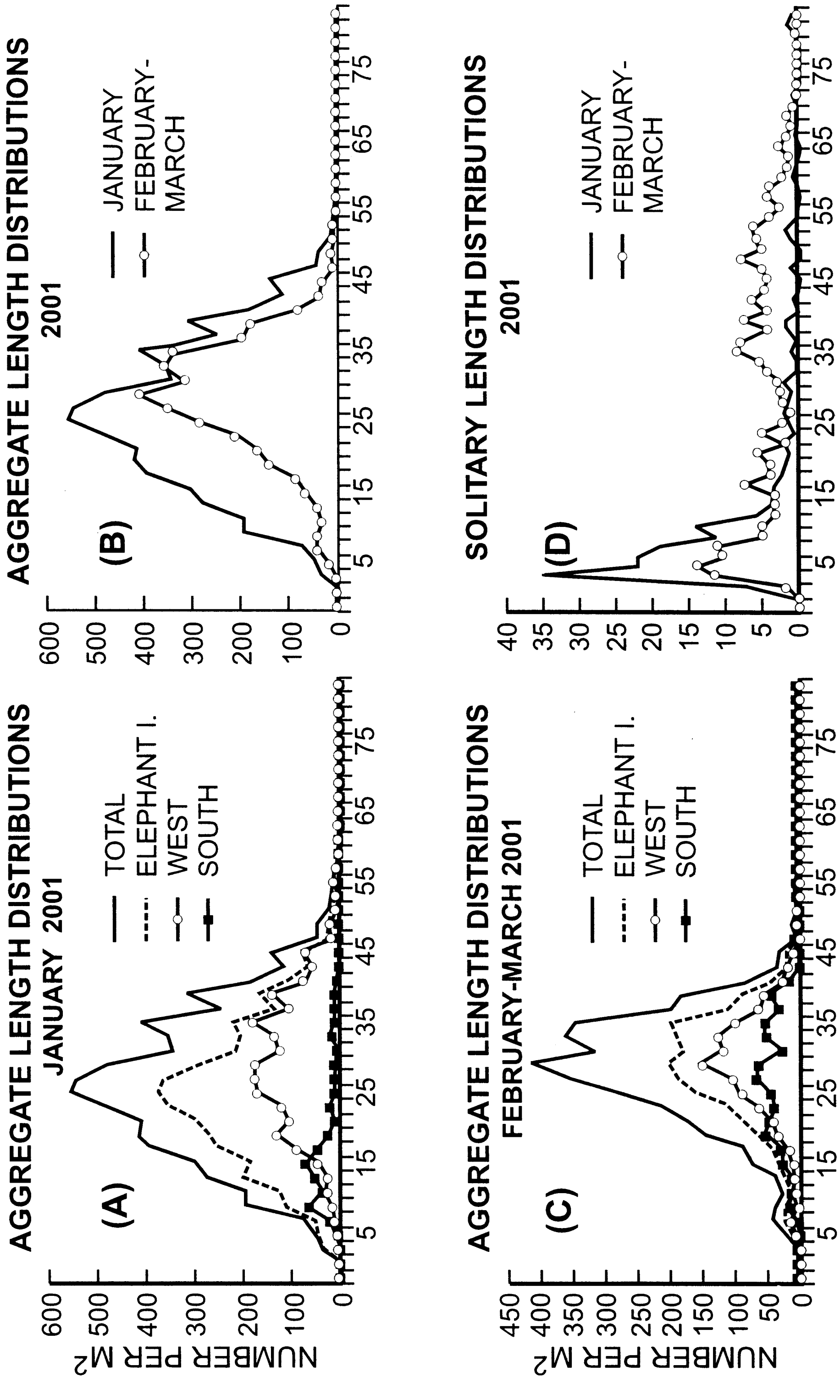

Figure 4.7. Length-frequency distributions of aggregate stage *Salpa thompsoni* in the Survey Area and three subareas (A) January 2001 and (B) February-March 2001 and seasonal differences in (C) aggregate stage and (D) solitary stage length-frequency distributions, January-March, 2001.

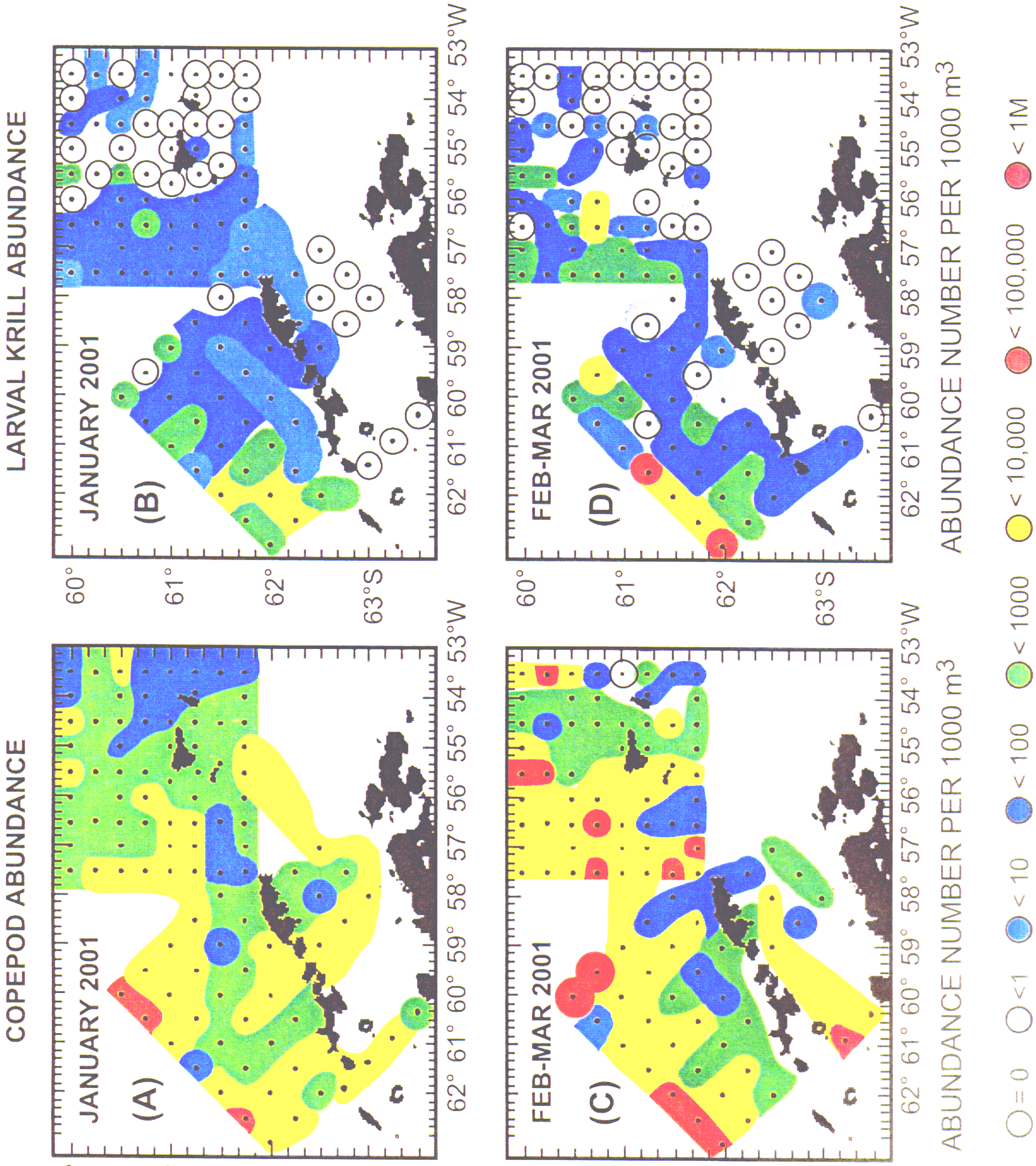

Figure 4.8. Distribution and abundance of copepods and larval krill in the (A,B) Survey A Area, January 2001 and (C,D) Survey D Area February 2001.

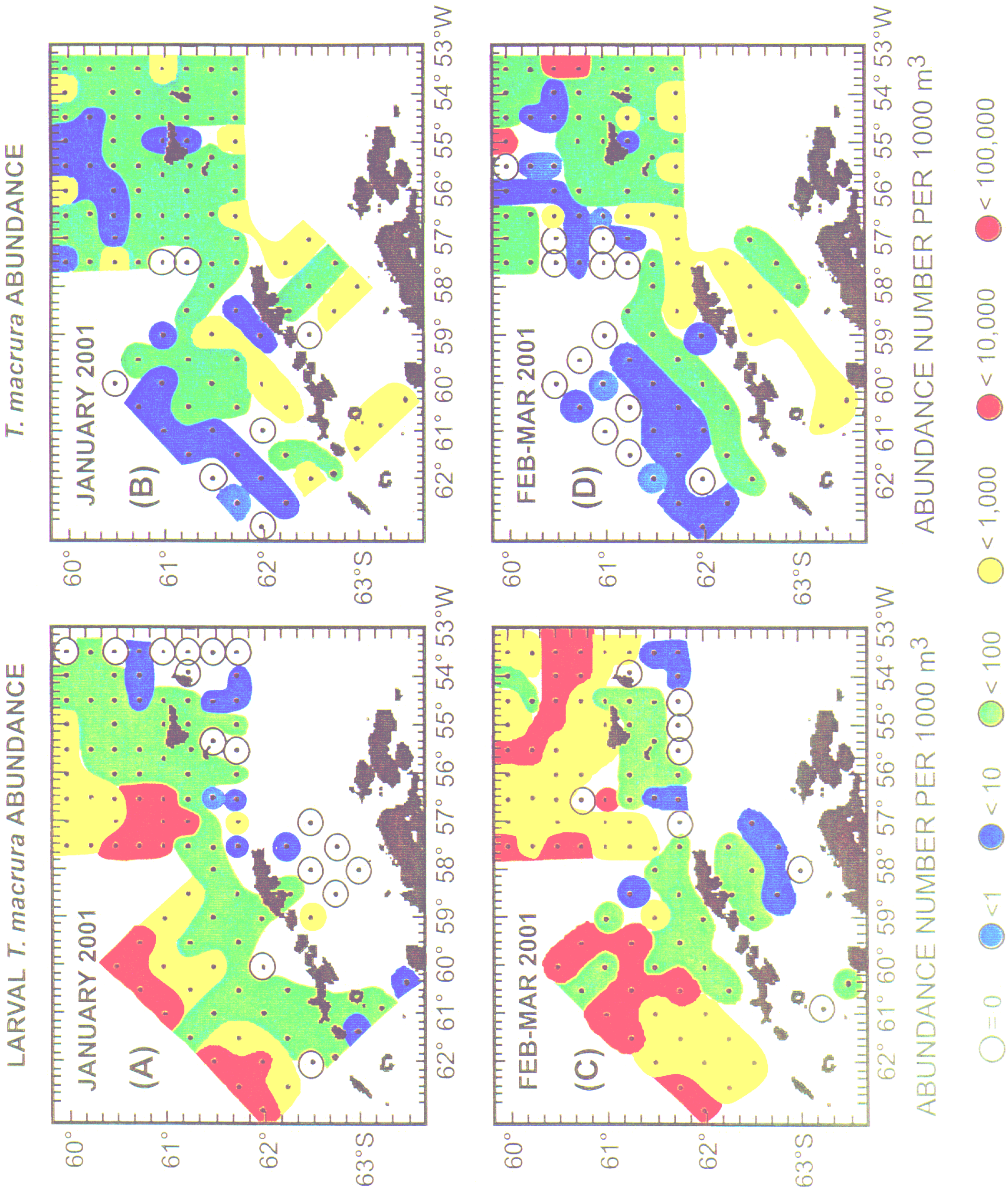

Figure 4.9. Distribution and abundance of larval and postlarval *Thysanoessa macrura* in (A,B) Survey A Area, January 2001 and (C,D) Survey D Area February-March, 2001.

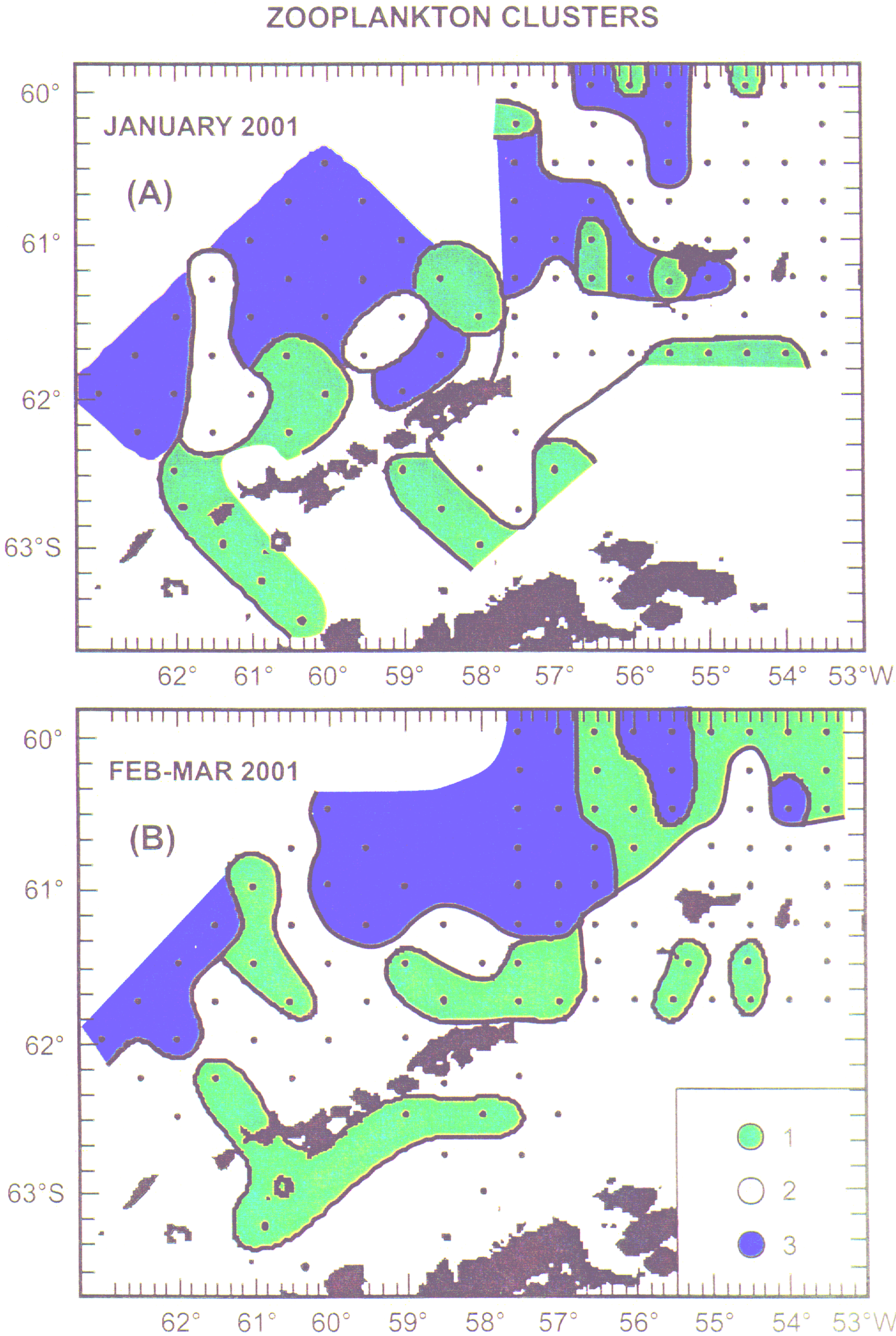

Figure 4.10. Distribution patterns of zooplankton taxa belonging to different station groupings in the (A) Survey A Area, January 2001 and (B) Survey D Area, February-March 2001.

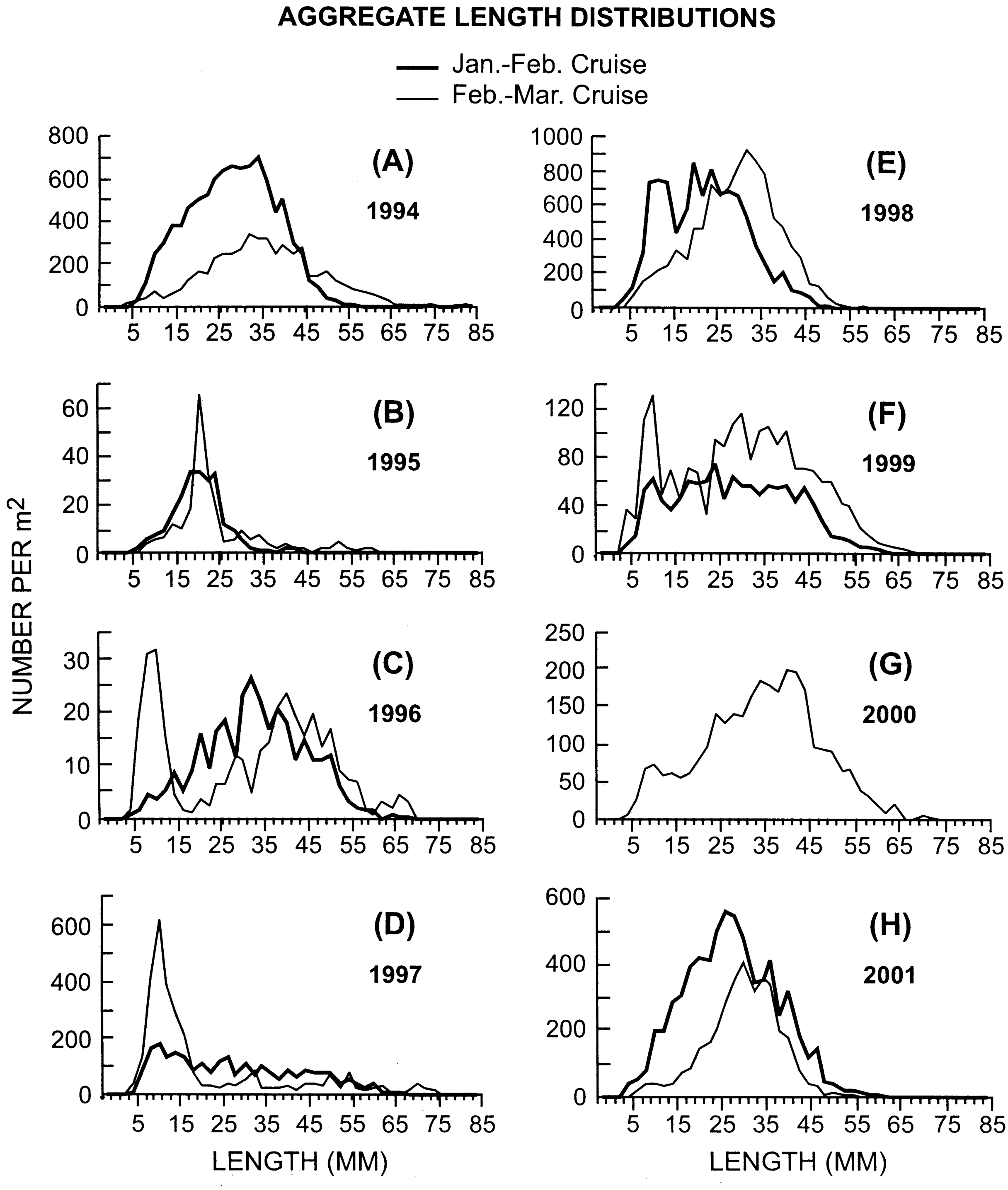

Figure 4.11. Length-frequency distributions of aggregate stage salps during AMLR cruises, 1994-2001.

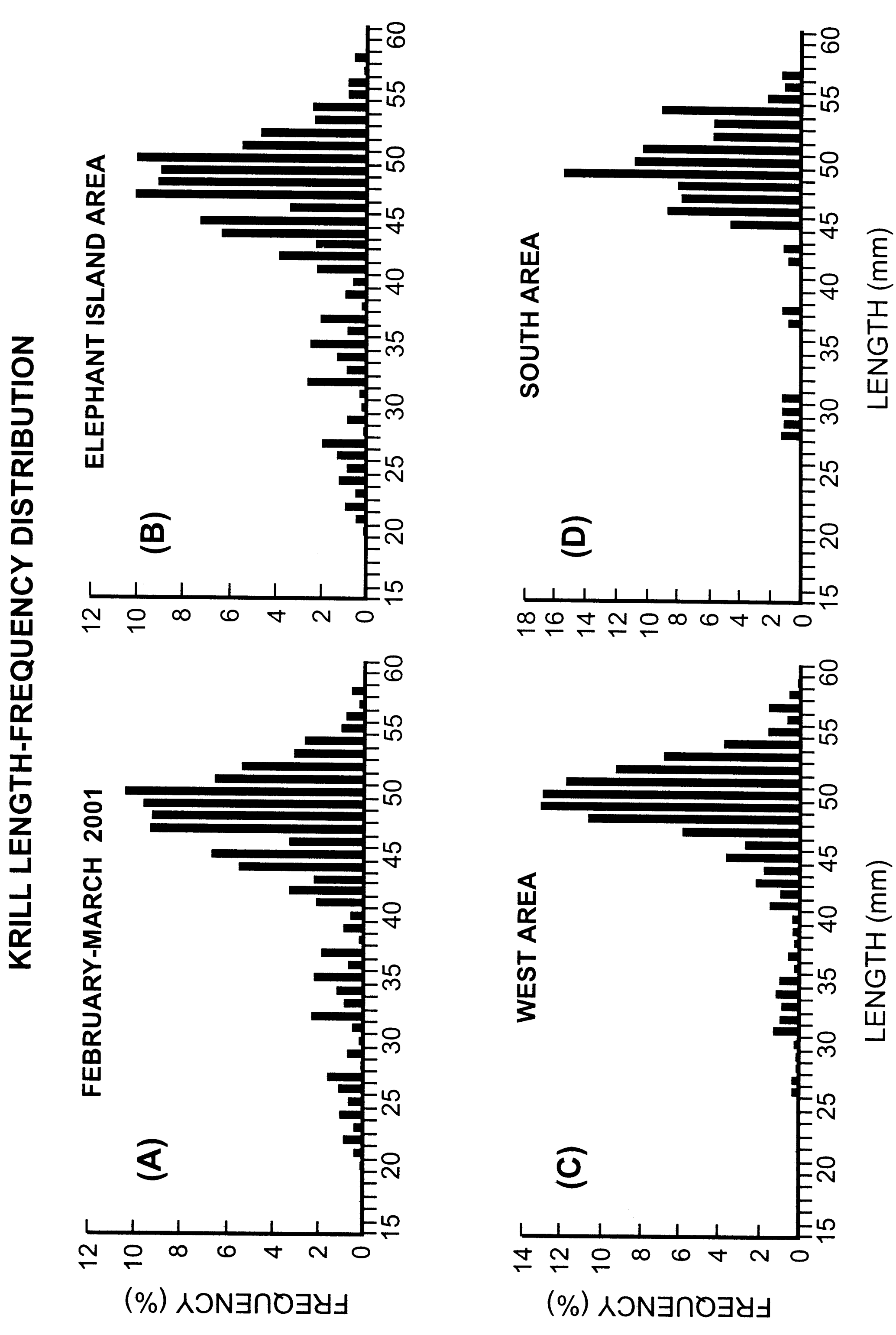

Figure 4.12. Overall length-frequency distribution of krill collected (A) during Survey D and in the (B) Elephant Island Area, (C) West Area and (D) South Areas, February-March 2001.

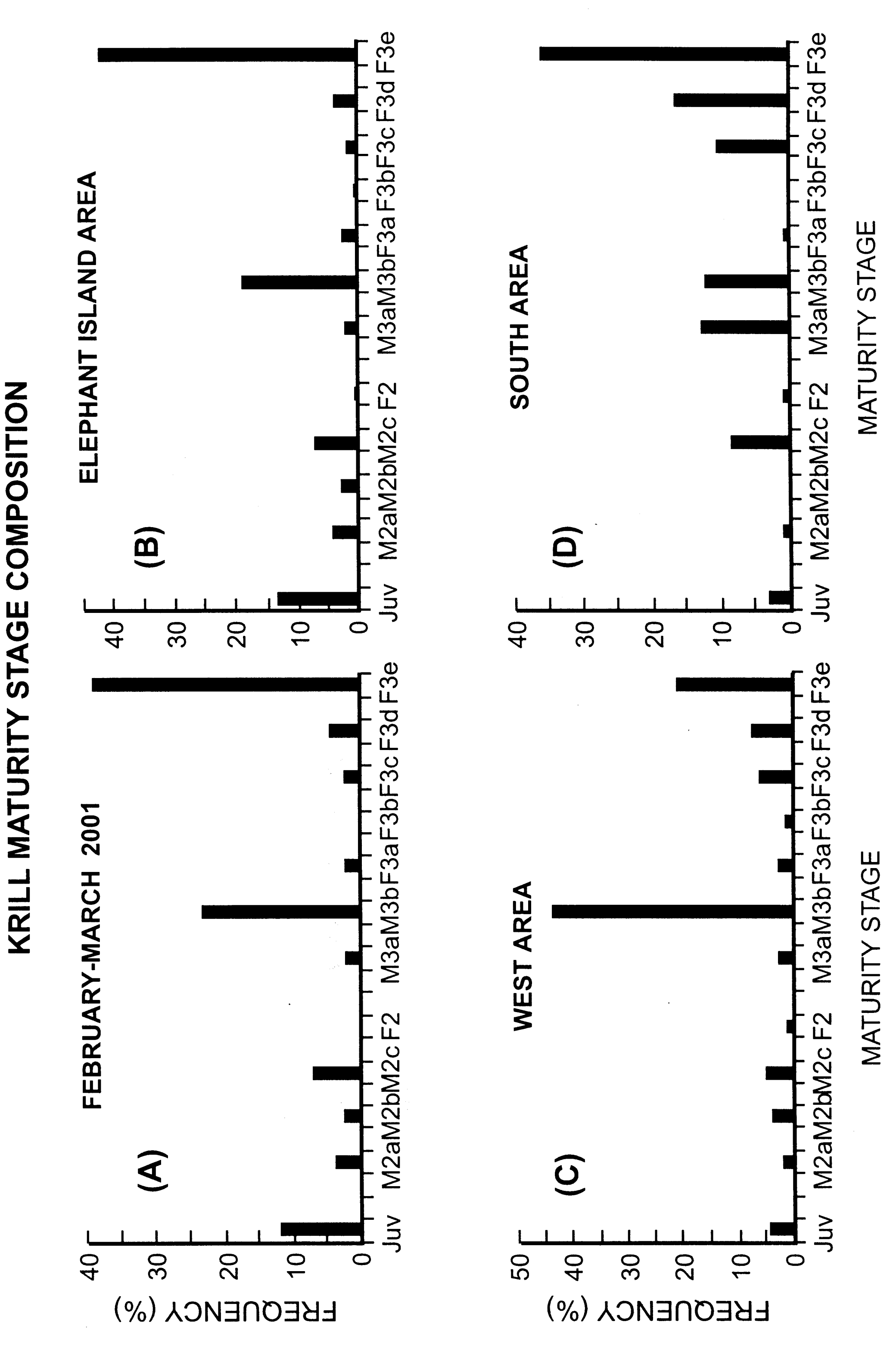

Figure 4.13. Maturity stage composition of krill collected (A) during Survey D and in the (B) Elephant Island Area, (C) West Area and (D) South Areas, February-March 2001.

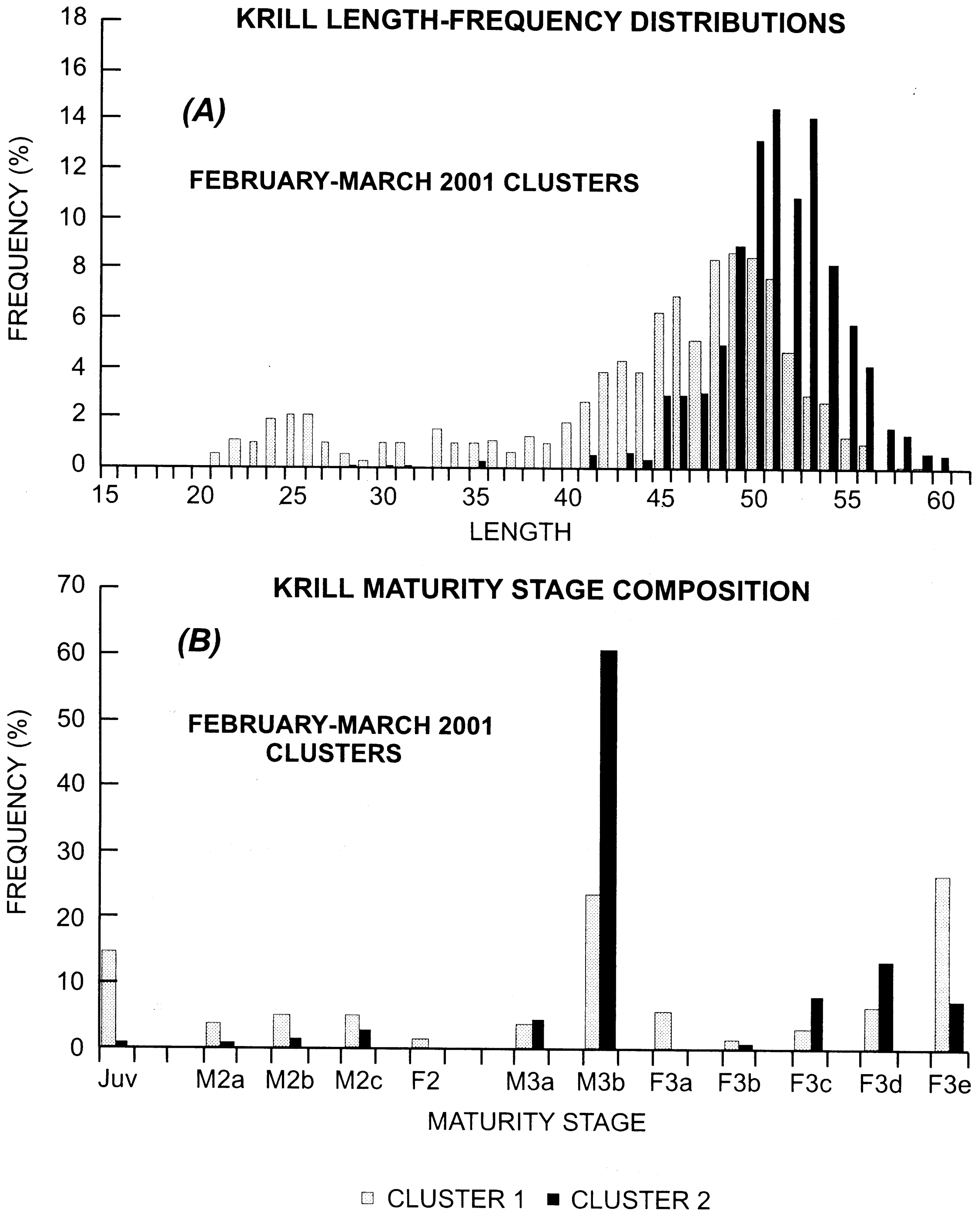

Figure 4.14. (A) Length-frequency distributions and (B) maturity stage composition of krill belonging to different length categories (Clusters 1 and 2) in the Survey D Area, February-March 2001.